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# Opportunities and Needs in Development and Adoption of Urban Agriculture for Food Security in Sub Saharan Africa

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**Abstract:** ***This discussion is concerned with food production in urban settings in Sub Saharan Africa. It seeks to highlight the opportunities and needs in development and adoption of urban agriculture for food Security in Sub Saharan Africa. The rapidly growing urban population in the region has tended to drive demographic, social and economic changes leading to the evolution of transformed urban food production systems, as some of the most efficient and sustainable contributors to food production. The food demand will tend to grow faster than its production, resulting in a growing food deficit, thus affecting food insecurity in urban areas. Under the circumstances urbanization will tend to be one of the major socio-economic factors that will drive the increasing demand for both crop and livestock products, due to concentrated and rapidly increasing urban population. It is therefore hoped that strategies to promote food productivity gains, should focus on setting up good infrastructure, appropriate agricultural policies and adoption of new technology approaches. Incentive to urban farmers credited by functioning in a policy environment fair to urban producers will also increase urban food production. There is need to understand the critical facets of agricultural production dynamics and the diversity of its underlying factors in order to improve food production in urban settings in Sub Saharan Af.***

**Keywords:** Urban Agriculture; Food Security; Sub Saharan Africa

## 1. Introduction

Urban agriculture may be defined as the production of fruits, vegetables, livestock, flowers and other natural food and non food materials within or near the limits of the cities, especially on vacant lots, in open spaces such as parks and in enclosed, indoor facilities such as greenhouses or aquaculture systems [*rica.*1]. Urban populations are growing more rapidly than the general population in Africa, and by 2025, nearly 55 percent of Africa's population will live in towns and cities as contrasted to 30 percent today[2]. The demand for food will tend to grow faster than its production, resulting in a growing food deficit in urban areas. The ability to maintain food security will depend on improved urban agriculture. This calls for intensification of urban food production to meet the predicted food demand by creating new models of urban food production, marketing and consumption patterns. It would be imperative to identify drivers, activities and how their interactions produce suitable outcomes that improve urban food production and security. Policies need to be put in place which legitimizes urban agriculture taking into account that many Sub Saharan Africa urban residents are actively involved in urban agriculture, however most urban areas do not have any policies that acknowledge urban agriculture as a legitimate land use.

## 2. Potential benefits and opportunities of urban agriculture in enhancing food security

Sub Saharan Africa's annual urban growth rate is 3.6 percent, almost double the world average [3].[4]estimated that about one quarter of the developing world's poor live in urban areas, but also that poverty is becoming more urban and the poor are urbanizing faster than the population as a whole. The bases for strategy proposed on urban agriculture to enhance food security emanate from the fact that urban population is growing rapidly and will continue to do so due to good health services care provision by individual states and improved nutrition of the local urban population. The demand for food products will definitely increase due to increased population in urban settings hence the ability to maintain food self sufficiency and food security within urban areas depend on the ability to employ alternative sources of food production. The urban poor will constitute a group that is at risk of food insecurity as a result it is important that the lower income urban dwellers are engaged in urban agriculture in order to meet their own food needs or to foster a livelihood where economic opportunities may be scarce.

Urban agriculture has a number of positive attributes for the residents who are engaged in it. Participants experience various benefits in urban agriculture including provision of participants with a range of products which includes enjoying the health benefit of fresh vegetables and animal products [5]. Animals may be readily converted into cash and can be well integrated into the crop livestock integrated

systems. Backyard food production can be a major contributor to a more balanced diet for urban communities [6]. It also offers prospects of a regular income source once the volume of production exceeds what the urban resource poor farmer wishes to use for household consumption. Households that practice urban agriculture are more likely to have access to a wider variety of nutritious food such as vegetables and animal products. Urban food production essentially may raise the urban incomes, improving access to food for the poor and enabling local livestock products to compete better with low price livestock imports. Urban agriculture can provide people with a primary or supplementary income. Collective benefits from urban agriculture are converting urban waste into fertilizers. The enjoyment of outdoor activities, sport and exercise, learning about nature, working with friends and neighbors on improving their livelihood are also indirect benefits of urban agriculture [7]. Urban agriculture should be promoted because urban dwellers produce little or no food and frequently lack the means to buy food. Urban setup is expanding constantly and as the cities expand, and as more people migrate from rural to urban areas, the number of the urban poor will rise. Urban hunger and access to affordable food in cities will therefore be increasingly important issues and support to food production programs within urban areas will be crucial. However, the new and traditional demand for livestock products due to urbanization will put pressure on already scarce agricultural resources. In Sub Saharan Africa the majority of urban residents are actively involved in urban agriculture, despite the fact that most of the urban areas do not have any policies that acknowledge urban agriculture as a legitimate land use. Urban agriculture activities have operated in policy vacuum which has resulted in conflicts between residents and city administrators. Sometimes city administrators have taken hostile approach in dealing with residents engaged in urban agriculture which has compromised food production efficiency and resulted in food insecurity. This is on the backdrop that in Sub-Saharan Africa, two-thirds of the working population in urban areas still makes their living from agriculture [8].

## 3. Strategies and Priorities for Education and Training to Support Urban Agriculture Development

Great strides have been made in education in Africa, however there is need to improve the quality of output at all levels of education, primary, secondary and tertiary which are important prerequisite to agricultural development. This will assume greater impact on development as intensification in food production proceeds and new technologies are adopted or introduced. Training in all spheres of food production need to be reviewed, introduction of centers which provide introductory levels of understanding of food production concepts which involve livestock and crop are recommended in urban areas. Urban women farmers training for specialized skills needs to be expanded to meet the changing needs of food production. University education should take into account the new order in sustainable food production. Universities should churn graduate from both from livestock and crops departments who are conversant with new methodologies applied in sustainable urban food production. Graduate should have the capacity to collaborate in training to achieve urban food production goals in the most effective manner. Post graduate courses in agricultural science should focus on how to improved urban productivity using new methods to promote food production.

## 4. Utilization of by-products and food waste in livestock production to enhance food security in urban areas

Urbanization will bring with it changes in lifestyle and consumption patterns, which mostly favor livestock products. To promote livestock production use of vegetable by-products of agro-industrial origins, arable by-products and urban markets vegetable and fruits by-products as potential animal feed resources in urban agriculture should be encouraged. Numerous studies have been performed to determine the use of vegetable by-products as potential source of animal feed with consistent results [9, 10, 11]. In animal production urban farmers would be looking for cheaper unconventional energy and protein sources to formulate least cost animal rations. Various types of unconventional feeds such as kitchen waste, banana leaf meals, cabbage leaves etc may be available, most of which are regarded as waste. Animal production in urban agriculture may be based on use of local resources and by–products such as cabbage , rape, cauliflower and kale have been good sources of by-products for animal feeding. Several by-products have potential value especially for ruminants due to their ability to digest fiber [12]. Utilization of by-products however is limited due to the poor understanding of their nutritional and economic value as well as their proper use in ruminants' rations [13]. Among the less used by-products are the fruits and vegetables market wastes. Vegetables encompass the herbaceous or edible parts of herbaceous plants which are widely cultivated for their food nutritive values. Interest in vegetable production and marketing around urban areas has increased rapidly in the last two decades as a result of greater appreciation of the importance of vegetables occasioned by rising awareness of balanced diet and knowledge of the fact that consumption of vegetables could create a healthy living than other food items. Production and marketing of vegetables also serve as an important source of livelihood for those outside the formal sector [14]. Consumption of fruits and vegetables plays a vital role in providing a diversified and nutritional diet. However the intensification of vegetables production around cities has created enormous volumes of vegetable by product which if put in good use have the potential of improving livestock productivity in urban areas. The waste of leaves from cabbages and cauliflower has been used as feed for goats [15]. Vegetables are not completely used but will partly be left in the garden or destroyed. The outer leaves are often discarded at the urban markets. They are trimmed and are dumped, burnt or thrown sometimes in water sources contributing to problem of environmental health hazard. These vegetable wastes from urban markets can be potentially useful livestock feeds in large amount all year round for urban livestock producers. Food leftovers in urban areas may also be a potential source of animal feed. The amount of food leftover generated in

urban areas is so much that if put in good use can be a valuable asset in livestock production. Various methods have been proposed on how to use leftover as animal feed, these include drying, wet feeding, fermentation, cooking and frying [16]. Fermented wet feed has excellent palatability and may control putrefaction. The feed containing leftover food had good nutritional value, favorable digestibility without harmful bacterial infection [17]. However, not all food leftover are considered to be effective in improving livestock production, as a result information on the use of respective food leftover and their nutritive value should be sorted from the local extension services.

## 5. Improved technology and food security in urban areas

The Sub Saharan Africa should adopt the use of new agricultural technologies to improve food production and ensure long term food security for all in spite of many challenges and risks that the region faces. It should build the necessary institutions which promote the development of new agricultural technologies and ensure that key decisions are taken and implemented on research investment on new agricultural technology. There is little doubt that adoption of new technology in urban agriculture will promote greater food production which will result in improved livelihood of urban dwellers. Productivity gains in urban agriculture food production systems eventually will level off unless improved technology and inputs are employed. Intensive commercialization of urban food systems using advanced technology and high level of inputs will enhance food security. However the adoption of new technology to enhance food production in urban areas simultaneously draws attention to questions of sustainability in production. Reliance on new technology will bring its own challenges to food producers in urban areas. Estimated achievable levels of increased productivity based on improved production and innovative technology adoption is feasible. An increase in productivity in urban agriculture is achievable provided that substantial progress is made in use of appropriate technology.

Use of appropriate technologies in promoting dry season farming may increase quantity of food produced which could be supplied throughout the year, especially in areas were rain fed agriculture has been unsuccessful. However the extent of dry season farming will depend on the availability of water harnessing technologies. Dry season food production should be supported by policy towards integrated water resource management which promotes the coordinated water development and management of water, land and related resources in order to maximize the resultant food production without compromising the sustainability of vital ecosystems.

## 6. Women involvement in urban agriculture and food security

Women have been recognized as the most effective marginalized group capable of promoting food security on the continent. The development of proper food production strategies which are gender sensitive are of paramount importance to assist women produce enough food for their families and communities at large. Evidence suggests that if women can be supported in terms of productive resources they may increase food production and enhance food security [18]. In this context the role of women is considered crucial, particularly in Africa were food insecurity is prominent. Creating more enabling environment for urban women can improve food security outcomes. Strategies that recognize the potential of women's multiple roles as food producers and providers at household level should be put in place.

The food production business is best done, provided there are incentives available to farmers awarded by the markets functioning in a policy environment fair to urban producers. Well organized markets and infrastructure has improved food production efforts in developed world, unlike in the third world where has production has been low due to poor infrastructure and unavailability of proper markets. The need for market development is paramount for successful processing, distribution and storage of food products. Poor marketing facilities means urban farmers may find it difficult to access agricultural inputs. On the same note well developed markets has several benefits to urban farmers mainly through food products disposal at lucrative prices. Organized marketing systems will drive urban farmers to increase their production and improve quality of products. Developed marketing facilities facilitate efficient communication therefore providing urban farmers freedom and access to information on price mechanisms.

## 7. Environmental issues related to urban agriculture

The task of providing adequate food for the urban growing population is surmountable, despite this, there is need to achieve the food production targets through increased food production, but at the same time minimizing adverse impact of such a drive to the environment. The drive towards promotion of urban agriculture production has created growing ecological and human health problems for many cities in Sub Saharan Africa. The growing demand for livestock products due to urbanization is likely to have undesirable impact on the environment. A growing number of people have become concerned about the long-term sustainability of existing food production systems to support the urban population explosion. The intensification of agricultural activities close to the urban centers may result in a range of environmental and public health risks. Evidence has accumulated showing that whereas the present capital- and technology-intensive farming systems have been extremely productive and competitive; they also bring a variety of economic, environmental and social problems [19]. Due to the continued human population growth out-pacing the continent's ability to produce adequate food supplies called for intensification of food production which has fueled concern on the unsustainable use of natural resources. Various sectors of societies slowly are realizing that agrochemical technologies, resource scarcity, environmental degradation and uncontrolled economic growth, etc., are seriously threatening the long-term limits of agricultural expansion [20]. The concentration and growing scale in urban agriculture has contributed significantly to

negative environmental and human health. The potential impact of livestock production activities on environmental quality has become a worldwide concern [21].The high food demand from increased urban population has forced urban farmers to adopt chemically intensive measures to increase their production of crops and livestock which has resulted in agricultural wastes becoming an enormous problem.

Waste and residues resulting from diverse agricultural practices for raising animals and growing crops are collectively called agricultural wastes and a pollutant can be any chemical substance, biological organisms, a product or a physical property that is released intentionally or inadvertently by man into the environment [22]. The production and management of waste generates many external effects. [23] cited three groups of externalities: (a) nutrient runoff and leaching from application of manure to crop land, (b) accidental spills and leaks from waste storage facilities and (d) direct ambient air pollution from feedlot and storage facilities including odors and ammonia gas. The accelerated exploitation of productive resources or inputs in urban agriculture to enhance food productivity has resulted in rapid increase in environmental pollution. With the development of the urban livestock production sector within and around cities, large amount of domestic animal waste have accumulated in the vicinities', as a result the animal waste has created environmental pollution such as contamination of water bodies and the production of obnoxious odors. Odor pollution may cause significant health hazards [24]. Odors emanating from gases such as ammonia, hydrogen sulphide and methanethiol of piggery waste are irritating and smelly with low odor threshold [25]. Animal waste may become major waste pollutants once they enter into water supplies. When confinement animal areas are cleaned or when these wastes are carried away by the runoff water contamination hence pollution and health hazards occur. Leakages of animal waste materials may over flow sending dangerous microbes, nitrates pollution and drug resistant bacteria into water supplies. Livestock waste contain many pathogenic microorganisms including bacteria, viruses and protozoa [26] hence application of these waste to land has the potential of causing environmental contamination. Several disease outbreaks related to water contamination with animal waste have been traced to bacteria and viruses from animal waste material. Urban livestock production raises different concerns of possible disease transmission from animal to humans, and chemical contamination from over use of animal health products. Recent reviews on the current status of parasitic diseases, including food-borne trematode, zoonoses and cysticercosis have highlighted the risks of disease transmission through animal waste [27].With no regular waste removal the pilling up of manure also presents a health hazard contributing to transfer of zoonotic diseases, rain water often washes manure and other agricultural wastes into the city's water bodies. Ultimately water bodies and underground water subsequently used as water catchment areas for public water supply system may also be contaminated. Policies which safeguard against permissible numbers of livestock in specific location based on human population densities and choice of animal enterprise should be put in place. As urban agriculture is intensified there should be growing concern about its impact on the immediate environment. Wide spread environmental damage may occur as a result of increased productivity from urban agriculture. The greatest threat is on water bodies which may be severely polluted. Regulatory measures that need to be put in place towards controlling animal waste disposal should be more stringent to avoid catastrophes; however the cost effectiveness of animal waste management and pollution control should not narrow the marketing margins of selling food products by urban farmers [24].

The inorganic fertilizers, no doubt are crucial input in intensive urban agriculture. When applied to soil they meet the nutrient requirement of crops. The effectiveness and efficiency of application of fertilizers depends on the type of management system adopted. In crop production the subsequent unchecked use of chemicals and pesticides has worsened an already desperate situation of pollution. Not all the quantities of applied inorganic fertilizers are taken up by the crop and some quantities are retained by the soil, which can be washed down by erosion or by drainage water into water sources or can also be lost into atmosphere as a gas. This has contributed to ozone layer depletion hence climatic variability. Excessive amount of nutrients from crop production often cause an explosion of algae that robs water bodies of oxygen, killing aquatic life. Agricultural waste can be better recycled by suitable methods like composting, dehydration and incineration. The most efficient method to avoid pollution by agricultural wastes is the use of biologically active systems of aerobic and anaerobic digestion. Anaerobic digestion of waste leads to production of methane gas which can be used as energy.

## 8. Implications

Rising demand for food in urban areas and a general decline in food production is a formula for continued to cause food insecurity in Sub Saharan Africa. Due to the projected increase in urban population satisfying the expected food demand will require a substantial increase in food production. It may suffice to suggest use of alternative sources of animal protein such as micro-livestock in urban farming. The implications for food production will have to be assessed and action be taken to deal with potential future food demands of an increasing and more affluent population in urban areas. To meet the projected demand new strategies may need to be developed which legitimize urban agriculture. Program of action that will enable urban farming to contribute to optimization of food production on equitable, sustainable and environmentally sound basis are recommended. Policies which address the issue of women discrimination in land ownership and tenure, where urban women are denied access to and control of land and other productive resources will fulfill women's potential as food producers. Urban agriculture has to use available resources as efficiently as possible to optimize production on the other hand inefficient use of resources can seriously hamper production. Given the potential of urban agriculture to contribute to food security, government policies for urban planning need to address land tenure and provide access to productive land resources to urban dwellers, while also protecting public health. The element of urban food systems must be satisfied if food security is to be achieved both effectively and efficiently. It is important to identify drivers,

activities and how their interactions produce outcomes that affect urban food security. Due to intensified production food systems there is need to adequately protect public health and the environment from pollution by agricultural waste. Small and medium agricultural activities located within and around urban areas may become major contributors to urban agricultural land and water contamination by dumping enormous amounts of untreated waste. The problem of animal and crop waste management in most African cities arise from the fact that in urban areas there is little land available to absorb animal waste, and many animal keepers are unaware of how to use the dung produced by their animals. Animal waste can be put in good use and even provide a source of income in some circumstances. Friendly technologies which can turn agricultural waste into a convenient and marketable product should be adopted. The modernization of waste management systems may be one of the solutions to curb environmental pollution. Without serious consideration of agricultural waste management infrastructure and highly weak environmental protection enforcement, urban agricultural waste from both crops and livestock ventures may cause serious environmental and human health problems. Strong urban food production base is essential to economic stability, healthy and high quality food supply. Urbanization will force a nutritional transition resulting in a wide spread shift from the traditional diets to diets relying more heavily on processed foods and prepared outside the home.

**'The authors declare that they have no competing interests'**

## References

[1] Lachance, J. 2004.Supporting urban agriculture: A proposed supplement to city of Detroit Master Plan Policies. MSc Thesis, University of Michigan, Taubman College of Architecture and Urban Planning, Michigan, USA.
[2] F.A.O, 1994.Women, Agriculture and Rural Development. Corporate Documents Repository, Economic and Social Development Department. A synthesis report of the Near East Region Adapted from Human Development Report and Country Papers, UNDP, 1994.
[3] UNPD, 2012. World Urbanization Prospects. The 2011 Revision, New York: United Nations..
[4] Ravallion, M., Chen, S.and Sangraula, P. 2007.New evidence on the urbanization of global poverty. Policy Research Working Paper 4199.World Bank, Washington, DC. New York.
[5] Alaimo, K., Packnett, E., Miles, R.A.and Kruger, D.J. 2008.Fruit and Vegetable Intake among Urban Community Gardeners.J. Nutr.Educ.Behav.,40(2): 94 – 101.
[6] Hardouin, J., Thys,É., Joiris., V. and Fielding, D. 2003.Mini-livestock breeding with indigenous species in the tropics.Liv Res Rur Dev 2003, 15(4).Retrieved February 6, 114, from http://www.lrrd.org/lrrd15/4/hard154.htm.
[7] Soonya, O 1999.Planning for urban Agriculture: A review of tools and strategies for urban planners. Cities Feeding People Series report 28. Intern Dev Res Centre, Ottawa, Canada.
[8] ILO, 2011.Towards decent work in sub-Saharan Africa. Monitoring MDG employment indicators. Eds: sparrebom T, Albee A. International Labour Office, CH-1211, Geneva 22, Switzerland, 2011: 29.
[9] Gustine, D.L. and Jung, G.A. 1985. Influence of some management parameters on glucosinolate levels in Brassica forage. Agron J.77: 593- 597.
[10] Lambert, M.G., Abrams, S.M., Harpster, H.W.and Jung, G.A. 1987. Effects of hay substitution on intake and digestibility of forage rape (Brassica napus) fed to lambs. J Anim Sci., 65: 1639- 1646.
[11] Rahman, M.A.and Reza, A. 1983. Study on the effect of unconventional sources of protein and energy for poultry. MSc Thesis, Department of animal nutrition. Bangladesh Agricultural University, Mymensingh, Bangladesh.
[12] Boucque, C, V. and Fiems, L.D. 1988. Vegetable by-products of agro-industrial origin. Liv. Prod. Sci., 19: 97-135.
[13] Schroeder, J.W. 1999. By products and regionally available alternative feed stuff for dairy cattle. North Dakota State University, NDSU Extension Services.
[14] Ngu, N,T., Ledin, I., Dalgren, M. and Nilsson, A. 2000. The potential of market waste from fruit and vegetables as livestock feed in urban areas of the Mekong Delta, Vietnum. In: Improving utilization of market wastes from fruits and vegetables in goat feeding (Ed. NT Ngu). MSc Thesis, Swedish University of Agricultural Sciences, Department of Animal Nutrition and Management, pp 1-17.
[15] Paek, B,H,, Kang, S.W., Cho, Y.M., Cho, W.M., Yang, C.J. and Yun, S.C. 2005. The effects of concentrates with dried leftover food on growth and carcass characteristics of Hanwoo steers. Asian-Austr. J. Anim. Sci. 18(2):209-213.
[16] Summers, J.D., Macleod, G.K., Warmer, W.C. 1980.Chemical composition of culinary wastes and their potential as a feed for ruminants. Anim. Feed Sci. Techn., 5(3):205-214.
[17] Meinzen-Dick, R. and Quisumbing, A. 2012.Women in Agriculture, Closing the gender gap: Global Food Policy Report, International Food Policy Research Institute.
[18] Conway, G.R. and Pretty, J.N. 1991. Unwelcome harvest: agriculture and pollution. Earthscan Publisher, London.
[19] Altiera, M.A. 1989. Agroecology: A new research and development paradigm for world agriculture. Agric. Ecosys.Environ., 27:37-36.
[20] Vukina, T. 2005. The relationship between contracting and livestock waste pollution. Rev. Agric. Econ., 25(1):66-88.
[21] Environmental Pollution through Agriculture (EPTA) Booklet Number 436, Eco Env, EES-12.
[22] Innes, R. 1999. Regulating livestock waste: economic perspective choices. Second Quarter, pp 14- 19.
[23] Ryer-Power, J.E. 1991. Health effects of ammonia. Plant/Oper Prog 1991, 10: 228-232.
[24] Henry, J.G., Gehr, R. 1990. Odor control; An operator's quide. J. Water Pollut.Contr. 52: 2523-2537.
[25] Mwadsley, J. L., Bardgett, R.D., Merry, R.J., Pain, B,F. and Theodorou, M.K. 1999. Pathogens in livestock waste, their potential to management through soil and environmental pollution. Appl. Soil Eco., 2(1): 1-15.
[26] De, N,V., Murrell, K.D., Cong, P.D., Cam, P.D., Chau, L.V., Toan, N.D. and Dalsgaard, A. 2003.The food borne trematode diseases and zoonoses of Vietnam, Southeast Asian.J Trop Med Pub.Health 34:12 – 34.