AJFAND ONLINE
Forward AJFNS
Volume 8 No. 1 2008
March 2008
ISSN 1684-5374
AFRICAN JOURNAL OF FOOD AGRICULTURE NUTRITION AND DEVELOPMENT

IMPACT OF URBAN AGRICULTURE ON WATER REUSE AND RELATED ACTIVITIES ON THE RURAL POPULATION OF THE COASTAL SETTLEMENTS OF ONDO STATE, NIGERIA

Yemi Akegbejo-Samsons[*1]

Yemi Akegbejo- Samsons

*Corresponding author: email: samsons56@yahoo.co.uk

[1] Yemi Akegbejo-Samsons, Ph.D., Associate Professor of Aquaculture & Coastal Resources Management, Department of Aquaculture and Fisheries Management, College of Environmental Resources Management, University of Agriculture, PMB 2240, Abeokuta, Nigeria. Tel: +234 8035021748; Email: samsons56@yahoo.co.uk

AJFAND ONLINE
Forward AJENS
Volume 8 No. 1 2008
March 2008
ISSN 1684-5374
AFRICAN JOURNAL OF FOOD AGRICULTURE NUTRITION AND DEVELOPMENT

ABSTRACT

Throughout the globe, agriculture is increasingly a part of city landscapes. Rising demands for water to supply agriculture, industry and cities are leading to competition over the allocation of limited water resources. It has been observed that coastal wetland settlements are usually worse hit by discharge and effluents of upper-stream water uses. This paper discusses the practice of urban agriculture (UA) and fishing, which is a predominant coastal activity in the coastal settlements of Ondo state of Nigeria.

It highlights the problems and prospects of urban agriculture on the local economies of the study areas. Results from this study show that UA was a preferred complement to rural agricultural practice. It was observed that UA complemented supplies from rural agriculture, whereby arable crops and regular village menu items are produced along side perennial crops. Products like tomatoes, okra, African garden-eggs and peppers are produced to complement those produced from rural agriculture. Increasing coastal poverty was found to have assumed a staggering phenomenon in over 64% of the visited coastal cities.

Community food security at the household level in the study area has forced the community to be involved in the following UA activities: (a) arable farming within open spaces and court yards; (b) vegetable production; (c) paddy rice production especially in cities like Mahin, Idiogba, that are located close to canals and lagoons; (d) cassava and yam production in upland coastal cities such as Igbokoda and Igbekebo. The results show that as successful as urban agriculture seems to be, incomes from fishing and other aquacultural activities was higher than rural and urban agriculture.

Successful local water recycling has not been practicable in the study area and as a result the same quality of water is used for human, animal and agricultural purposes. Specifically, over 80% of household water demand is from canals, rivers and streams in these study areas. This was found to have a serious health implication. In monetary terms, incomes from fishing were found to be higher than that from urban agriculture by over 65%, however fishers still prefer to combine UA with fishing for reason of food intake (feeding the family with staple food varieties). Sustainable management of the coastal areas for overall productivity is advocated.

Key words: Urban Agriculture, Water, Local Economies

INTRODUCTION

Urban agriculture (UA) has been defined as an industry located within (intra-urban) or on the fringe (peri-urban) of a town, city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-) using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area [1]. About 40% of the world's population lives within 60km of the coast. In Africa, trends in population growth indicate that this figure could rise to 75% within the next century [2].

The coastal wetland of sub-Saharan Africa is in rapid transition. Burgeoning populations swollen by rural-rural migrants and political refugees, growing competition for natural resources and living space, wide-scale pollution and the transformation of the vast areas of the coast in a bid for rapid economic growth threaten welfare and future development [3]. In the poorest urban communities, food security is the bottom line on why UA is important. With the growth in world human population, the over-exploitation of land based resources and the recent surge in advance of technology, there is increasing reliance on the maritime environment for a range of often conflicting uses such as: the provision of food; the disposal of waste; transport and communication; mineral extraction; and for recreation and leisure.

Coastal urban centres in Nigeria are going through numerous transformations which have continued to shape its social and spatial structure in the course of development. The shallow coastal areas bordering Nigeria have traditionally supported highly productive ecosystems from which fish and other aquatic resources have been harvested. Productivity and usefulness of these coastal and marine areas have dramatically diminished and the prospects for sustainable development are greatly jeopardized.

Urban agriculture can provide very good solutions to many serious problems. In some policy circles, it can be used as a way out of dealing with real structural issues of poverty, unemployment and malnutrition. Studies carried out in the coastal areas of Ondo state showed a direct relationship between poverty and fisheries resource management techniques, hence there is need to reduce or eradicate poverty among the fisher-folks [4]. Nigeria is a maritime state with a coastline of approximately 853 km. This coastline stretches from the western border with the Republic of Benin to the eastern border with the Cameroon Republic. Much of Nigeria's population and economic activities are located along the coast with over 20% of the population inhabiting coastal areas.

Of the 36 states in the country, 8 (Lagos, Ogun, Ondo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross River) are located in the coastal zone.

There is clearly a need for an orderly and balanced approach to the management and development of our valuable marine and coastal resources in order to secure the maximum benefit and at the same time to today's complex social requirements.

This paper, therefore, looks at the impact of UA on the coastal environment and the influence of other related activities on the local economies of the study areas. The reality of water use and re-use on the environment in the study area was also investigated.

MATERIALS AND METHODS

Description of study site

The study was carried out in the coastal wetland area of Ondo state. This is bounded in the East by River Benin in Edo state, in the West by Ogun state coastline and in the North by Okitipupa and Irele local government area. This area is parallel to Nigeria's South-West coastline, which is characterized by extensive lagoons and river- delta system. It is part of the 853 kilometer length of the coastal length of Nigeria.

The area is largely a concentration of mangrove and freshwater swamps. The mangrove zone is inundated by salt water from 2 to 10 months of the year. This mangrove system has three main sub-zones, viz: the freshwater, saltwater and brackish water. The entire area is poorly drained particularly during the rainy season when the rivers and creeks overflow their banks. The high availability of water contributes to the formation of extended wetlands around the entire area, with a variety of ecologically significant habitats such as *Rhizophora racemosa* and *Avicennia* spp

Sociological characteristics

There are over 76 settlements along and within the coastal fringe of the study area, whose major occupation is artisanal fishing interjected with farming, hunting and trading. The major settlements include Igbokoda, Idiogba, Aiyetoro, Mahin, Zion Pepe and Orioke-Iwamimo From a study carried out a few years ago, the settlements were categorized into the following: (a) Class ONE villages: These are the most thinly populated villages, having an estimated fish yield of 30 metric tons per annum. There are ten villages in this class: Orioke 1, Orioke 2, and Akereke; (b) Class TWO villages: These are mostly located within the coastal swamps, with the exception of a few villages along the creeks and canals. There are 29 of such settlements which account for a per annum fish yield between 30-100 metric tones; (c) Class THREE villages: These are fewer than class two in population, but more than class one. The per annum fish yield is put at 100-200 metric tones. Members of this class include Ajegunle, Okenla, and Ogogoro; (d) Class FOUR villages: These represent the smallest number in the entire classification with only two villages- Kugbonre and Kepete. The annual fish yield is over 200 metric tones per annum; (e) Class FIVE villages: The last class represents the most important villages in the area with only six members. They are Aiyetoro, Ajegunle, Zion Pepe, Idiogba, Mahin and Gbekebo. In all, about 3000 stakeholders were assessed.

Assessment of Urban Agricultural activities

The different activities that are related to urban agriculture were assessed through the administration of structured questionnaire. The fishermen and farmers were interviewed while the questionnaires were distributed to them during the various village meetings in the months of July to December 2003. Inputs used by farmers were assessed; the different activities that constitute urban agriculture were identified, in addition to other economic activities in the study area.

Water Reuse options and methods

Water recycling and reuse options and methods were investigated. The different major ways of water use were assessed in situ. Problems associated with water use and re-use were investigated by the use of well structured questionnaire. Water quality was assessed on the spot (where possible, using odour and colour) in selected villages. Laboratory analysis of samples taken was carried out using the AOAC methods [5]. Water availability in the required quality was also examined.

Assessment of Local Economies

The impacts and effects of urban agriculture on the livelihoods of the stakeholders were analyzed by using the incomes generated from the different farming systems. The contributions of all other activities to the economy of the study area were calculated by using the tangible and intangible values of produced outputs. This was done by calculating the quantity and market value or price of the goods. The income from UA activities was compared to other predominant activities that prevailed in the area of study.

RESULTS

The results of this study show that the area is inhabited by three major ethnic groups, viz.: (a) the Ilajes, who form about ⅔ of the entire population; (b) the Ijaw Arogbos, and (c) the Ijaw Apois, who are the Yoruba speaking group.

Table 1 shows the socio-economic characteristics of the farming systems in the study area. Fishing activity was the greatest activity that created the largest annual income per farmer in the study area with an estimated income of N850,000.00 per farmer per annum. This same sector had 95% of the population operating in the system. Coastal aquaculture was second in terms of income (N650,000.00) accruing from the sector. Peri-urban food crop farming engaged over 70% of the population in this sector, and contributed an estimated annual income of N210,000.00 to the rural economy of the farmers. Urban vegetable farming had a relatively low population engaged in it but contributed significant in terms of annual income to the farmers (N218,000.00). Table 2 shows the current production practices and operations of urban agriculture and other activities in the study area. Open spaces near underdeveloped urban lands were mostly used for urban vegetable farming while livestock farming utilized land space along water courses. Fishing was primarily carried out in both open and privately owned water bodies. Communal and private fishing was found to be very high in the study area. Food crop farming in peri-urban areas were mostly carried out in undeveloped private and government lands. Coastal aquaculture entailed the construction of ponds along shallow canals and marine beels. The production practices were however not sophisticated, as local tools were mostly utilized by the farmers. The results showed that farming practices associated with hunting, cash crop farming and alcohol brewing contributed to wildlife decimation, forest destruction and destruction of mangroves respectively. Table 3 shows the average values of the chemical and nutrient composition of the water in the sampled area of study. Values of pH, calcium and organic matter decrease as one moves from freshwater to the marine (from stations 1 to 10), however values of major nutrients such as nitrate, chloride, sulphate, silicate increase from the fresh water to the marine system

DISCUSSION

The main thrust of this paper was to investigate the impact and effects of urban agriculture and water reuse on the local economy of the coastal wetland communities of Ondo state of Nigeria. The results will be highlighted and discussed in three major areas of focus. First, on the contribution of urban agriculture to the livelihoods and socio-economic characteristics of the inhabitants, second, on the practice of urban agriculture and its consequent effects or influence on the environment, and other prevalent economic activities such as fisheries, aquaculture, farming etc and, third on the impact and relevance of water use and re-use in the coastal areas of study.

Socio-economic characteristics

The results of this study show that the area is inhabited by three major ethnic groups, viz.: (a) the Ilajes, who form about ⅔ of the entire population; (b) the Ijaw Arogbos, and (c) the Ijaw Apois, who are the Yoruba speaking group.

The two Ijaw groups combined constitute only ⅓ of the population. Table 1 shows the socio-economic characteristics of the farming systems in the study area. According to the 1991 population figure, the population of the inhabitants is about 54,000 people, with over 85% as fishermen. However, a significant quota of the people engaged in other activities such as hunting, trading, and local gin brewing. The common local industries in the study area include local gin brewing, iron smiting, net fabrication, boat building etc. Economic activities include urban agriculture (vegetable, food crop and livestock farming), trading, fishing, coastal aquaculture, and plantation development.

The highest annual income was generated from fishing activities (N850,000.00). Fishing contributed 31.9% to the economy of the stakeholders This was followed by coastal aquaculture, contributing 24.4% with an annual income of N650,000.00. The fishermen and fish farmers collected fingerlings and brooders of *Clarias gariepinus, Heterotis niloticus, Heterbranchus bisordalis* and the tilapias which they reared in enclosures, ponds and cages. The cultivation of cash crops (oil palm and coconuts) along the coastal length of the seashore contributed about 12.7% income to the economy of the inhabitants.

Urban agricultural practices were mainly carried out within and around the major cities and fairly populated villages, especially in open and marginal lands. These practices include vegetable farming, livestock and food crop enterprises. Annual farming incomes from these three urban agriculture activities were about N218,000.00, N85,000.00 and N210,000.00 respectively, amounting to 19.3% of total income from all activities.

Benefits of urban agriculture

Table 2 shows the current production practices and operations of urban agriculture and other activities in the study area.

The lead feature of UA which actually distinguishes it from rural agriculture is its integration into urban economic and ecological system which we can refer to as 'ecosystem'. The fact is that it is embedded in and interacting with the urban ecosystem [6]. The coastal environment of Ondo state is a unique terrain that survives largely on the riches of the aquatic resources. This has its soaring effects on the attitude of the people that requires more than seafood for their livelihoods. Results from this study show that the practice of UA has numerous benefits to both the environment and the indigenous people. Among these are:

(a) Urban and village food demand were noted to be higher than supply in locations where UA practice was not possible. Fishermen depended on supplies that were mainly from 'port towns' like Igbokoda, Atijere, Igbobini and Mahin. Households in the study areas consume about 10% of harvested fish while they spend between 50-75% of their income from fishing on food.

(b) Where UA was considered to be effectively practiced, the retail price of local vegetables and root crops were significantly lower than settlements that could not practice UA. 20% of the stakeholders were observed to engage in vegetable farming, 15% on livestock and 70% on food crop urban agriculture in the study areas. 20% of produced vegetable and 25% of cultivated food crops were consumed by members of the households of producers.

(c) Self-produced farm items provide nutritious food otherwise unaffordable to the low-income households. For example, in Ayetoro and Aiyelala, urban gardens have significantly increased the quality and quantity of food available to the producers' households.

(d) Impact of UA on community welfare was very high in coastal centres like Aiyetoro, Ajegunle, Idiogba and Mahin. Farmers and fishermen contribute to community welfare through generation of employment to youths and post-secondary school leavers, who help to water and maintain urban gardens and annual crop farms such as pineapple, maize, okra, melon and orchards. Direct marketing by the producers play a significant role in the communities. This is reflected in the magnitude of incomes from the various enterprises. The practice of direct sales reduces the prices of the farm produce and at the same time removes the drudgery of 'ferrying' them from one jetty to another, which of course leads to higher prices.

(e) In most of the study areas, UA was found to be a preferred complement to rural agriculture. It was observed that UA complemented supplies from rural agriculture, whereby arable crops and regular village menu items are produced along side perennial crops. Products like tomatoes, okra, African garden-eggs and peppers are produced to complement those produced from rural agriculture.

Clearly, UA makes a vital contribution to the food self-reliance of many cities in Africa [7]. While UA can not be expected to satisfy the urban demand for staple crops and tubers, it does supply a significant share of food, especially the more easily perishable vegetables and fish products.

Urban agriculture and community food security

Studies that have undertaken actual measurements of the impact of UA on food security generally support the hypothesis that UA does improve the food security of vulnerable households. The scale of urban production is generally underestimated. It has been declared that as much as 40% of the population in African cities is involved in UA [8].

In this study food insecurity is a common concern among all the interviewed coastal communities in Ondo state. Ranked in order of importance, survey respondents give the following reasons for engaging in UA among the various communities: (a) Production for household consumption; (b) income enlargement; (c) supplementary employment; (d) income diversification. A similar study in Nairobi shows that farmers participating in organized UA support programme were significantly better off than non-farming households [9].

The main goal for vegetable growers in the study area was to generate cash incomes. With the percentage of produce consumed at the family level of some enterprises, it is evident that the level of poverty is very high among the fishermen in the entire area of study. The issue of poverty in the coastal communities has been long discovered and discussed. With growth rates of 3% or more per year, populations in many coastal African countries will double by the year 2025 [2]. This will place enormous pressures on the coast.

Increasing coastal poverty was found to have assumed a staggering phenomenon in over 64% of the visited coastal cities. Community food security at the household level in the study area has forced the community (mostly women) to be involved in the following UA activities: (a) arable farming within open spaces and court yards; (b) vegetable production; (c) paddy rice production especially in cities like Mahin, Idiogba, that are located close to canals and lagoons; (d) cassava and yam production in upland coastal cities such as Igbokoda and Igbekebo. This is similar to the observation of Nugget, where it was observed that women and children work for the family plot which is controlled in about 75% of the cases by a male adult of the family [10].

The results of the study show that women constitute the largest proportion involved in trading, vegetable production, food crop and alcohol brewing, where they are involved in the various production levels such as the simple farming, harvesting and sales of produce.

In monetary terms, incomes from fishing were found to be higher ($6159 p.a per farmer) than that from urban agriculture by over 36.1%, however fishers still prefer to combine UA with fishing for reason of food intake (feeding the family with staple food varieties).
This is higher than the estimates from Dar es Salaam for full time producers of vegetables and dairy cattle, whose income were $US 60/month [10].

Impact and benefits of water reuses

Table 3 shows the average values of the chemical and nutrient composition of the water in the sampled area of study. Values of pH, calcium and organic matter decrease as one moves from freshwater to the marine, however values of major nutrients such as nitrate, chloride, sulphate, silicate increase from the fresh water to the marine system. Farming activities were highest at the freshwater areas while fishing was highest in the brackish water ecosystems.

Competition for water use is a serious barrier to many endeavours in the coastal areas. While in the landlocked cities of Nigeria, water recycling and reuse has taken some decisive approach, water quality specifications and standards in the coastal areas is yet to be pursued in most of the coastal centres of the study areas. In all the sampled centres, there was no evidence of potable water. There were no purification or water treatment stations for human consumption.

Results show that water for human consumption and domestic use was from (a) rain water, (b) wells or shallow boreholes and (c) the streams, rivers and canals that ramified most of the entire coastal landscapes. Specifically, over 80% of household water demand was from canals, rivers and streams in areas like Mahin, Idiogba, Ajegunle, Ugbonla, Kiribi and Gbolowo.

Water for agriculture was found to be mainly from canals and rivers in all the sampled coastal cities. Urban and rural agriculture seem to be the major consumer of "just any type of water". In most of the visited coastal cities, over 75% of the rice fields were irrigated using direct water linkage from streams, and in most cases they were established in floodplains.

Results obtained from the study show that over 90% of the sampled areas consume untreated water directly from all available sources. The health implications of this action include acute occurrence of diarrhoea, typhoid, and various symptoms of water borne diseases. The same quality of water was found to be used and re-used for human, animal and agricultural purposes.

CONCLUSION

In this study, limited access to productive resources in terms of access to land, security of tenure, availability of water and other inputs were found to be major constraints to local food production. These shortcomings can be remedied through efficient and effective land use policies and land reforms by the federal legislature as done in Accra, Ghana [13]. The study carried out in Havana probably offers the most successful example for which the concept of UA was used as a response to a food crisis, not only by individual residents, but also as a government-supported strategy [14]. This strategy could be applied by government in this study area.

The conclusion that can be drawn from this study is that UA can make contribute positively to the nutrition and health of local stakeholders who engage it. The average income from the different UA activities in the study area supplements both diets and incomes of the urban

poor. It is anticipated that where UA is encouraged by policy, it can provide a very significant portion of food needs, greater income and poverty alleviation.

ACKNOWLEDGEMENT

I wish to acknowledge the assistance of the University of Agriculture, Research and Development Centre, Abeokuta, Nigeria for providing the funds used for the research (Research Grant # RESDEC 169).

Table 1: Socio-economic characteristics of the farming systems

Farming systems	Gender Male (M)/ Female (F)		Annual farming income (estimate per farmer)	Proportion of harvest consumed per family (%)	Average years of education	% of population operating the farming system
Vegetable farming (urban)	205	1,450	N218,000.00	20	5	20
Livestock farming	2,833	28	N85,000.00	5	8	15
Hunting	1,839	20	N72,500.00	3	2	5
Trading	495	2,197	N86,000.00	5	5	45
Fishing	5,400	4,350	N850,000.00	10	5	95
Coastal aquaculture	3,487	1,354	N650,000.00	9	6	65
Food crop farming (peri-urban)	2,469	2,665	N210,000.00	25	10	70
Cash crop farming	3,763	55	N340,000.00	10	6	55
Alcohol brewing	1,268	2,366	N150,000.00	25	6	26

1US$ = N138.00 Nigerian currency

Table 2: Production practices and operation of urban agriculture

Farming system	Land and land-use characteristics	Production/Farming practice	Environmental issues
Vegetable farming (urban)	Open space usually near undeveloped urban land; flat or gently sloping land.	Use of simple tools; small-scale operation and farm size; creating planting beds for long periods.	Alternative use of land; no solid or liquid waste is generated
Livestock farming	Open land space along water courses;	Rearing of domestic animals like goats, sheep, pigs, chickens etc; open and fenced ranged systems in some villages	Not significant
Hunting	Along forests, thickets and mangrove swamps.	Use of dane guns, traps and local catching devices	Decimation of wildlife biodiversity
Trading	There are designated market squares for community trade; there are private stores, stalls and food markets	Locally produced farm produce; consumables from other villages and manufactured products from cities.	Unsanitary disposal of market wastes after every market day.
Fishing	Fishing in customarily owned water bodies and other open waters. Communal and private fishing; Open water ways, swamps and lagoons.	Use of varieties of fishing methods such as seine net, caste net, drag net, traps etc	Uncontrolled and unguided fishing and use of obnoxious fishing methods lead to decimation of fish stock.
Coastal aquaculture	Construction of shallow ponds along the canals and flooded land areas; stocking of marine beels with trapped fish; use of fishing aggregates to culture fish for long periods	Pond site acquisition and construction; Intensive and semi intensive fish culture practices.	Pressure from village development to relocate fish farms; flooding of ponds during high tides and heavy rainfall;
Alcohol brewing	Open riparian forests and raphia mangroves.	Tapping of raphia exudates and brewing the liquid into local gins and alcohol.	Destruction of Raphia mangroves.
Food crop farming (peri-urban)	Undeveloped urban and peri-urban land for other uses; near schools, local health centers and government buildings.	Use of simple tools to make heaps for cultivating yams, cocoyams, banana, plantain, cassava, melon and maize. Contiguous farm lots and mixed farming system. Irrigating crops with water from dugouts.	Declining in soil fertility; application of inorganic fertilizers; chemical pollution from fertilizers;
Cash crop farming (Oil palm)	Large plantations along the coast line; where possible coconut trees more than oil palm trees; rows of cultivated trees along coast length.	Clearing of land strips along coast line; use of simple tools for land demarcation, lining, planting and slashing.	Destruction of coastal fringe for the establishment of plantains;

Table 3: Chemical and nutrient composition of the water in the sampled areas (average values)

	Sampling stations										
Parameter	**Units**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Hydrogen ion (pH)	Nil	6.8	6.9	6.8	6.2	6.2	6.3	6.0	6.1	6.1	6.1
Salinity	‰	0.05	0.06	0.05	0.30	0.36	0.37	1.20	1.23	1.36	1.40
Oxygen	mg/l	6.5	6.8	6.9	7.0	7.0	7.1	7.3	7.0	7.2	7.1
Calcium	,,	132	131	136	93	94	96	63	64	63	63
Magnesium	,,	68	69	70	81	83	86	86	103	103	106
Sodium	,,	64	63	63	76	803	821	821	902	905	905
Potassium	,,	171	173	169	64	68	63	71	72	72	73
Alkalinity	mg/l $CaCO_3$	23	23	22	25	25	26	24	36	38	36
Sulphate	,,	28	28	27	26	27	28	28	28	29	30
Chloride	,,	65	64	63	107	108	108	109	207	206	207
Silicate	,,	1.0	1.0	1.1	2.3	2.1	2.4	2.5	2.3	2.3	2.4
Nitrate	ug/l	18	21	22	20	26	24	24	25	25	26
Phosphate	ug/l	34	36	38	32	33	34	33	33	30	28
Organic matter	mg/l	3.6	2.7	3.2	3.1	3.2	2.8	2.8	2.6	2.7	2.8

REFERENCES

1. **Mougeot LJ** Urban agriculture: Definitions, presence, potentials and risks. **In** Nico Bakker et al (Eds) Growing cities, growing food. Urban agriculture on the Policy agenda. A reader on Urban agriculture. Proceedings of organized workshop by GTZ, CTA, ACPA, Sida and DSE. Havana, Cuba, October 11-15, 1999.

2. **Odada EO** The impact of human activities on Africa's coastal and marine areas and the implications for sustainable development. **In** : R.S. Arthurton et al (Eds) African Basins. LOICZ Global change assessment and synthesis of River catchment-coastal sea Interaction and human dimensions. LOICZ Reports & Studies No 25. 2002

3. **Hatziolos M, Lundin CG and A Alm** Africa: A framework for Integrated coastal zone management. Africa Environmentally sustainable Development Division, The World Bank. pp150 + Appendix. 1994.

4. **Akegbejo-Samsons Y and AB Aromolaran** Poverty, short term earning and Fisheries management practices: Realities from Ondo state coastal wetlands, Nigeria. *Jour. of Environ. Extension.* 2000; **1(1)**: 54-62.

5. **AOAC.** (Association of Official Analytical Chemists). Official Methods of Analysis, 15th ed. AOAC, Arlington, VA. 1990.

6. **Awosika L** The sub-Saharan Africa coastal zone: assessment of natural and human induced changes. In: R.S. Arthurton et al (Eds) African Basins. LOICZ Global change assessment and synthesis of River catchments-coastal sea Interaction and human dimensions. LOICZ Reports & Studies No 25. 2002.

7. **Ritcher J, Schnitzer WH and S Gura** Vegetable production in periurban areas in the tropics and subtropics: food, income and quality of life. Proceeding of an international workshop, Zschortau, 14-17 Nov 1994. Feldafing, Germany. ZEL, DSE & Council for Tropical and subtropical Agricultural Research (ATSAF) 1994.

8. **Mougeot L** Urban food production evolution, official support and significance. Cities Feeding People Series Report 8. Ottawa: IDRC. 1994.

9. **Mwangi AM** The role of urban agriculture for food security in low income areas in Nairobi. Leiden African Studies Center. 1995.

10. **Nugget R** The impact of urban agriculture on the household and local economies. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda.

11. **Gertel J and S Samir** Cairo: Urban agriculture and visions for a 'Modern' city. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. ZEL, FADC 2000.

12. **Foeken D and AM Mwangi** Increasing food security through urban farming in Nairobi. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. ZEL, FADC 2000.

13. **Arman-Klemesu M and D Maxwell** Accra: Urban agriculture as an asset strategy, supplementing income and diets. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. ZEL, FADC 2000.

14. **Novo MG and C Murphy** Urban agriculture in the city of Havana: A popular response to a crisis. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. ZEL, FADC 2000.

15. **Arma-Klemesu M** Urban agriculture and food security, nutrition and health. In N. Bakker et al (Eds) Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. ZEL, FADC 2000.