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**PLANNING AND MANAGING URBAN ORGANIC SOLID WASTE IN AN AFRICAN
CITY: LINKING ORGANIC SOLID WASTE COMPOSTING TO URBAN
CULTIVATION IN
ACCRA, GHANA, WEST AFRICA**

by

Raymond Asomani-Boateng

A thesis

presented to the University of Waterloo

in fulfilment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Planning

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ABSTRACT

PLANNING AND MANAGING URBAN ORGANIC SOLID WASTE IN AN AFRICAN CITY: LINKING ORGANIC SOLID WASTE COMPOSTING TO URBAN CULTIVATION IN ACCRA, GHANA, WEST AFRICA.

The effective management of urban solid waste presents a great challenge to cities of Sub-Saharan Africa. The ineffectiveness of the conventional approach, which is limited to the collection and disposal of wastes out of the sight of city residents, is widely known. Heaps of garbage found in undesignated sites in African cities is common; some cities in Africa were even being dubbed "cities of garbage" and "cities of mess" by the mid 1980s. Across Africa the waste collection rate is around 40 to 50 per cent, and an overwhelming majority of disposal sites are poorly managed open dumps, some located in densely-populated and ecologically-sensitive areas.

The unsustainability of the conventional system on social, economic and environmental grounds has necessitated finding more effective strategies to waste collection and disposal in African cities. Agenda 21 and the Earth summit in 1992 along with Habitat II in Istanbul in 1996, brought increased attention to these issues. Many international donor agencies have given priority to the provision of these services and are encouraging governments to invest in solid waste management strategies such as recycling organic solid waste in urban food cultivation, an area which has also received the attention of solid waste management experts, researchers and consultants. The abundance of organic solid waste, which ranges between 60 to 90 per cent of the municipal waste stream in African cities along with the presence of large number of urban cultivators in need of organic materials for use as soil conditioner, suggest that urban cultivation has the potential to reduce the total volume of waste requiring disposal.

There is a dearth of studies into finding effective solid waste management strategies but studies into developing effective and sustained linkages between urban cultivation and municipal solid waste management is lacking, and there is an absence of models or frameworks to facilitate such integration. The research focused on how to integrate urban cultivation and municipal solid waste management through organic solid waste composting.

The main objective of the research was to explore, demonstrate, and develop effective and sustained linkages between urban farming and municipal solid waste management through organic solid waste composting as an urban management and resource conservation strategy to improve the efficiency of municipal solid waste management practices in Accra, Ghana. The study had four specific objectives: (i) to examine the nature, components and current status of urban cultivation in Accra and identify how organic solid waste from the city's waste stream is currently being utilized; (ii) to examine the environmental, economic, social, institutional and cultural opportunities and constraints of recycling organic solid waste into urban cultivation in Accra; (iii) to identify farmed areas in the city that are suitable for both food cultivation and on-site composting of organic solid waste:

(iv) to develop a conceptual planning and management framework which links organic solid waste composting and urban food cultivation in Accra and which might be applicable to other cities in Ghana as well as other Sub-Saharan African cities faced with similar waste collection and disposal problems. It emphasized techniques of integration and means to manage issues arising from the integration of the two sectors. For each objective, specific research questions were developed to help generate and elicit the relevant data.

This study adopted a qualitative approach using multiple data gathering techniques (eg. participant observation, semi-structured face-to-face interviews, informal discussions and conversations with local farmers, government officials, waste generators, urban management institutions users and potential users of compost to gather different kinds of information and data. The field work consisted of a socio-economic survey and a community-based source separation and composting demonstration project.

Major findings from the study were: (i) a significant proportion of the city's organic solid waste which can be composted is wasted; (ii) recycling organic solid waste into urban cultivation can divert enormous quantities of waste from the city's waste stream; (iii) the practice of using untreated waste in the form of wastewater cow and chicken manure is common and widespread; (iv) the availability of incentives, familiarity and knowledge about source separation and composting, and collection systems used impact on participation rate and the sustainability of community-based source separation and composting projects; (v) urban cultivation in Accra is an age-old and predominantly male activity undertaken by migrants and (vi) availability and security to land are major problems facing urban cultivators in Accra.

A conceptual planning and management framework linking organic solid waste composting and urban food cultivation was proposed as an outcome of the research. The framework consists of (i) a public education component; (ii) storage, collection and transportation of source-separated organic solid waste; (iii) marketing of compost using various communication channels; (iv) the creation of waste reuse urban cultivation zones; and (v) the implementation of the framework at the sub-district level focusing on residential communities and neighbourhoods.

The study concluded with policy recommendations to promote the WRUC concept emphasizing on the (a) the promotion of compost and manure use in urban cultivation, (b) increased support for waste-based urban cultivation, (c) the introduction of new and revision of old municipal by-laws to accommodate WRUC practices, (d) incorporating WRUC zones into urban land use planning, and (e) the introduction of aggressive strategies to market compost.

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To my family, and to my dear wife Christina, and my two lovely daughters, Maame Ohenewah and Maa Abena, I give my gratitude and love.

GLOSSARY OF ABBREVIATIONS

AMA	Accra Metropolitan Assembly
ARP	Accra Rehabilitation Programme
CPP	Convention Peoples Party
ERP	Economic Recovery Programme
IDRC	International Development Research Centre
IMPACT	Integrated Municipal Programme for Accra City Transformation
IRCWD	International Reference Centre for Waste Disposal
KVIP	Kumasi Ventilated Improved Pit Latrine
MSWM	Municipal Solid Waste Management
NGO	Non Governmental Organization
NRCD	National Redemption Council Decree
OFY	Operation Feed Your Self
PNDC	Provisional National Defence Council
SGUA	Urban Agriculture Support Group
UA	Urban Agriculture
WMD	Waste Management Department
WRUC	Waste Reuse Urban Cultivation

To the memory of my late mother Christina Afua Ohenewah
who in her lifetime toiled to put me through school

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Chapter 1

OBJECTIVES AND SCOPE OF STUDY

1.1 Introduction

Managing municipal solid waste constitutes one of the fastest growing problems facing city authorities in both developed and low income countries. The situation is critical in African cities, where municipal solid waste management has reached crisis proportions. The exponential growth of Africa's urban population, coupled with the physical expansion and sprawling of cities, diminishing financial resources, inadequate management capacity, poor planning and adoption of inappropriate technologies, have also contributed to the poor state of municipal solid waste management in most African cities. Negative impacts on health, the environment and overall quality of life for urban residents have reached deplorable proportions. For example, Adedibu and Okenkule characterized Lagos, Nigeria as the "dirtiest" capital in the world, mainly

because in most parts of the city, streets are partially blocked by solid waste. Similarly, open spaces, market places are littered with solid waste and in most cases drains are clogged or totally blocked and many compounds are hemmed in by solid waste (1989:91).

This deplorable situation is not unique to Lagos, but exists in most African cities, which clearly indicates that solid waste management in African cities is extremely ineffective. Kulaba (1989) observed that on average, city authorities in Tanzania collect only 24 percent of the refuse; in Kinshasa, Zaire, Mbuyi (1989) noted that household waste collection and street cleaning were restricted to wealthy neighborhoods, while in the remaining areas household waste is dumped along roads, into illegal dumps, into storm water drains or

buried. In Nigeria, Onibokun, (1989) pointed out that 35 per cent of Ibadan's households, 33 per cent of Kaduna's households, and 44 per cent of Enugu's households did not have access to any formalized waste collection..

The socially, economically and environmentally unsustainable conventional system has necessitated the development of effective strategies to address waste collection and disposal problems in African cities. Recycling organic solid waste for use in urban farming through composting is a sustainable strategy to improve the efficiency of solid waste management practices in Africa's urban areas. Such an approach is being encouraged by solid waste management experts, researchers and consultants (Syagga, 1993; Chimbouwu and Gumbo, 1993; Diallo, 1993; Lee-Smith and Menon, 1994; Abutiare, 1995; Asomani-Boateng and Haight, 1998) as a means to at least handle organic fraction which makes up major component of municipal waste stream.

International research and funding organizations like the International Development Research Centre, the Food and Agriculture Organization, the World Health Organization and the World Bank are advocating bringing agriculture back into towns and cities, urban agriculture it is suggested can improve food security, regenerate the environment, and strengthen urban economies. To this end the Global Initiatives for Urban Agriculture was launched in 1996 at the third meeting of the Urban Agriculture Support Group (SGUA) hosted by IDRC in Ottawa, Canada, at which the author was a participant. SGUA acknowledged, among other things, that the "best use of urban solid waste and wastewater is for food production monitored by strict public quality control" (SGUA, 1996).

The abundance of organic materials, ranging between 60 and 90 per cent of the municipal solid waste stream of African cities (Obeng and Cointreau, 1997), the ever-growing quantities of organic materials and the presence of a large number of urban cultivators who are in need of organics as a soil conditioner, suggest that there is the potential to reduce the total volume of waste requiring disposal. The economic value of inorganics like hard plastics, glass, and metals has spurred their recycling and reuse but, the recycling of organic waste has up to now been neglected. Since it is mostly organic solid waste which piles up in African cities and to the degradation of the urban environment, the need to recycle waste into urban agriculture is critical.

Studies aimed at developing effective and sustained linkages between municipal solid waste management and urban agriculture in African cities are lacking. Previous and current research on urban agriculture focuses on the social and economic benefits of urban farming (Sanyal, 1985; Maxwell, 1994; Aipira, 1995; Waters-Bayer, 1995), spatial distribution and patterns, and constraints and impediments to and motives for urban farming (Rakodi, 1988; Lado, 1990; Freeman, 1991; Streiffeler, 1991). Questions of who cultivates in African cities and their socio-economic characteristics, have been thoroughly investigated (Mazingira Institute, 1987; Maxwell and Zziwa, 1992; Lee-Smith and Menon, 1994; Mbiba, 1994; Sawio, 1994). Studies to improve municipal solid waste management practices have focused on collection and disposal (Mbuyi, 1989; Mabubua, 1991; UNDP/World Bank, 1991; Pfammatter and Schertenleib, 1996); composition, volume and generation rates (Tevera, 1993; Syagga, 1993); and institutional (UNCHS, 1989; Dohrman et al., 1991; Tevera, 1991c) and informal resource recovery (Tevera, 1991b; Gould, 1992).

The preceding analysis reveals a gap in the research on integrating urban agriculture and municipal solid waste management in Africa's urban areas as well as a neglect of practical opportunities for organic solid waste to be part of a "closed loop" within African cities that is not possible without urban agriculture. Sawio (1993) and Chimbowu and Gumbo (1993) have observed that research on the integration of urban agriculture and municipal solid waste management is lacking and call for studies in this area. It is against this background that this research is being conducted. This Ph.D research is a continuation of my Masters thesis, successfully completed in 1994 and entitled "Planning for Domestic Solid Waste in Developing Countries: A Pilot Project of Community Composting in Accra, Ghana". The present research, however, has a much broader scope, as it addresses the issue of developing effective and sustained linkages between urban agriculture and municipal solid waste management through composting in African cities, using Accra, Ghana as a case study.

1.2 Selecting the Study Area

For an empirical study of integrating urban agriculture and municipal solid waste management through community-based composting, the Accra metropolis has been selected as the unit of analysis and focus of this study. Accra was selected because it exemplifies issues of urban farming and solid waste collection and disposal problems which prevail in several Sub-Saharan African cities. It is one city in Africa where, under the "Africa's Sustainable Cities" program, International organizations in conjunction with Central and Municipal governments, NGOs, Community-based organizations and the private sector are involved in finding solutions to a host of urban management problems. In addition, the researcher is very

familiar with the study area, which makes data collection and field work easier given the time and money constraints.

Municipal solid waste management remains one of the most intractable and critical problems within Accra (Songsore, 1992). In 1983, refuse collection and disposal in many parts of the city reached such deplorable conditions that a public outcry for a "state of emergency" had been raised (Ghanaian Times, June 6, 1983). Waste dumped into storm drainage channels, creeks, lagoons, and other water impoundment points creates serious environmental problems which can become disastrous. The 1995 floods which swept the city and caused the death of 30 residents and destroyed property worth millions of dollars were attributed partly to refuse which blocked the city drainage channels (Daily Graphic, July 5, 1995).

In crisis situations, ad hoc and short term measures have been developed to address Accra's solid waste collection and disposal problems. These range from calling in foreign experts, appealing for foreign aid, and procuring expensive and sophisticated foreign collection trucks and equipment, to mass mobilization of university and college students and community groups to clean and desilt drainage channels, clear mounting piles of garbage and dispose of it out of the sight of city residents. These ad hoc and short term solutions have proved ineffective; hence in 1994 a ministerial oversight committee on Accra's sanitation was established by the Accra Metropolitan Assembly (AMA) to find lasting solutions to the city's waste collection and disposal problems. The committee had as part of its mandate the opportunity to explore recycling the city's organic waste into urban cultivation, but due to the lack of data and frameworks, the committee has not been able to design any effective strategy based on linkages between urban cultivation and organic solid waste recycling.

With about four thousand urban farmers (Sackey, 1998) who are in need of organic matter to use as soil conditioner, coupled with the fact that 80-90 percent of the city's solid waste stream consists of organic and inert materials (ash and dirt sweepings) (Kramer et al., 1994), research to assess the practicality of preparing the city's organic waste as a soil conditioner in food cultivation is an urgent necessity. The problem is the absence of a framework or model linking municipal solid waste management and urban agriculture in Accra.

1.3 Research Problem

In spite of the need to integrate municipal solid waste management and urban agriculture as an urban management tool to address solid waste collection and disposal problems, specifically in Accra and other African cities in general, no research has been undertaken to explore and develop linkages between the two sectors. This study is based on the hypothesis that a significant proportion of the urban waste stream can be diverted from disposal by redirecting organic solid waste into urban food cultivation through community-based composting.

1.4 Research Goals and Objectives

The goal of this research was to explore, demonstrate and develop effective and sustained linkages between urban food cultivation and municipal solid waste management through organic solid waste recycling as an urban management and resource conservation strategy in order to improve the efficiency of municipal solid waste management practices in

Accra, Ghana and other cities in Sub-Saharan Africa. The research focused on techniques of integration, and the means to plan, manage and address issues arising from the integration of urban cultivation and municipal solid waste management. Specifically, the study seeks to:

- (i) examine the nature, extent, components and current status of urban farming in Accra and identify how organic solid waste from the city's waste stream is currently being utilized;**
- (ii) examine the environmental, economic, social, institutional and cultural opportunities and constraints of organic solid waste recycling in food cultivation in Accra;**
- (iii) identify areas in the city that are being farmed and suitable for both food cultivation and on site composting of organic solid waste;**
- (iv) develop a conceptual planning and management framework which links organic solid waste recycling and urban food cultivation in Accra and which might be applicable to other cities in Ghana, as well as other Sub-Saharan African cities faced with similar solid waste collection and disposal problems.**

1.5 Research Questions

To pursue these objectives, the study investigated the following research questions:

- (i) What is the, demographic and socio-economic distribution of urban food farmers in the Accra Metropolitan Area?**
- (ii) Where in the city is urban food cultivation undertaken? What agricultural practices are involved? What is the acreage of urban land-use under cultivation? How many urban residents are engaged in food crop cultivation?**
- (iii) How is organic solid waste from the city's municipal solid waste stream currently being utilized? Who uses it, in what form, and for what purpose? What is the nature and what are the characteristics of organic solid waste generated in the city?**
- (iv) To what extent do urban farmers use recycled organic solid waste in food cultivation? What are the methods of organic solid waste utilization in urban food cultivation in Accra?**

- (v) Are farmers interested in using recycled organic solid waste for fertilizing their farms, and what are the opportunities/barriers to recycling organic solid waste in urban food cultivation?**
- (vi) Are there any programs and policies in place for promoting the use of recycled organic waste in urban cultivation, and are policy makers prepared to provide support for the integration of organic solid waste recycling into urban food cultivation?**
- (vii) Do municipal solid waste management policies encourage the use of recycled organic solid waste in urban food cultivation?**

1.6 Organization of the Thesis

The chapters in the thesis reflect the major themes in this study. No chapter is completely independent and self-contained. Rather, a continuous flow with cross-references to other chapters and materials is presented throughout. Chapter 1 provides an overview and introduction to the study, the research problem, goal and objectives of the study and an overview of the study area. A review of research and studies on municipal solid waste management, urban agriculture and organic solid waste recycling, and issues in organic waste/urban agriculture interface in Africa are discussed in Chapter 2. Some relevant urban management and planning concepts are presented in Chapter 3. The study design is presented in Chapter 4. The findings from the interviews, and surveys conducted during the fieldwork are presented and discussed in chapter 5. Chapter 6 presents a framework for Waste Reuse Urban Cultivation. Finally, chapter 7 provides a summary and recommendations.

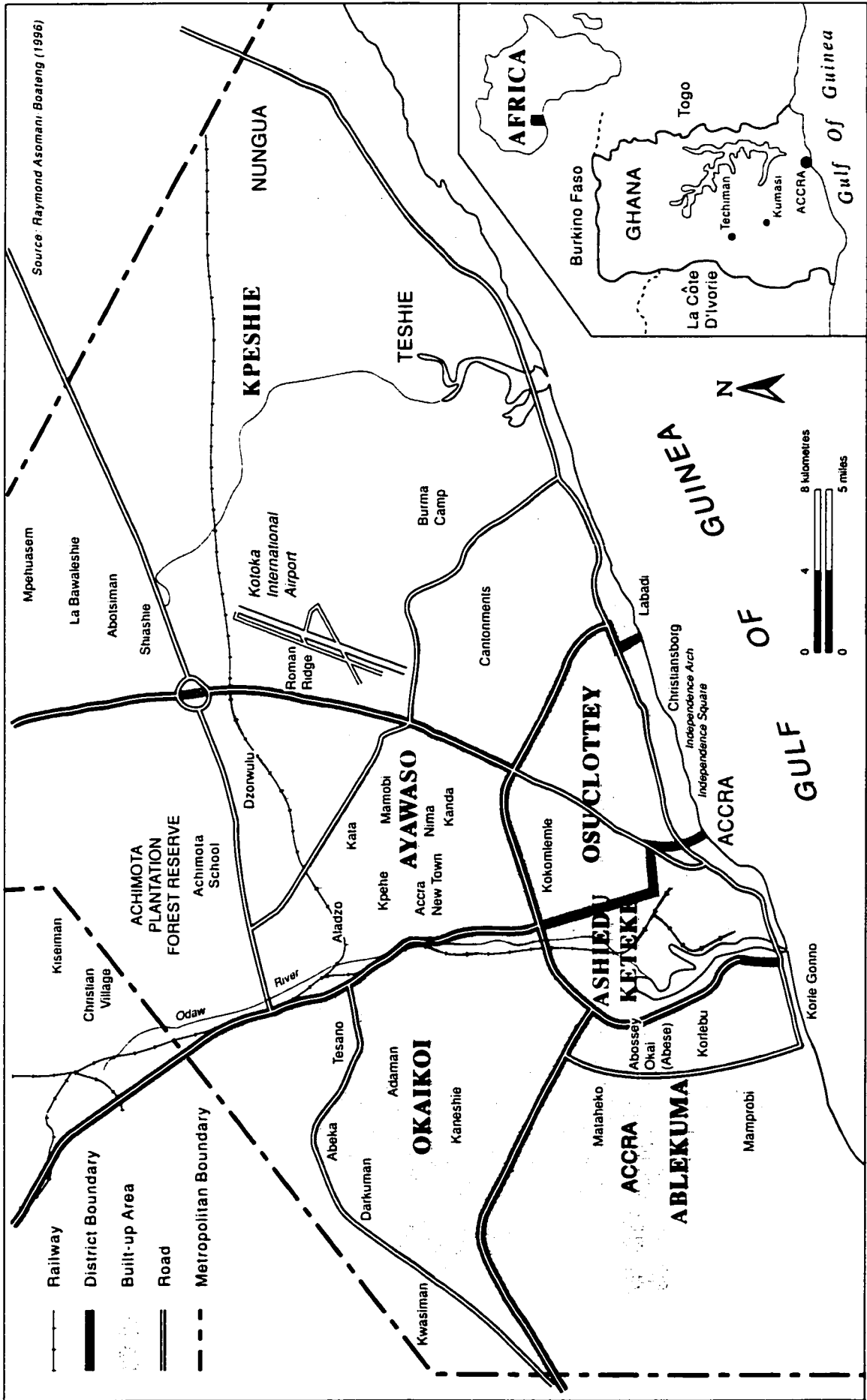
1.7 Overview of Study Area

The Accra Metropolis or Accra District is the focus of this study. It is therefore important to have an understanding of the dynamics of the city. Essentially, this section examined the physical and socio-economic characteristics, the status of the urban environment, and the policies, programs, regulations, and institutions for managing the urban environment.

Accra Metropolis, which occupies an area of 225 square kilometers (AMA, 1995), covers sixty-eight electoral districts grouped under the six sub metropolitan districts of Ablekuma, Okaikwei, Ayawaso, Asiedu-Keteke, Osu Klottey and Kphesie (Fig. 1.1). The metropolis is bounded to the east, south and northeast by the Tema district. The north, northwest, west and southwest borders the Ga district. To the south is the Gulf of Guinea.

Accra lies within the coastal plains of Ghana and has a general elevation of about 75m above mean sea level. The metropolis is drained by the rivers Densu (which is the city's major source of water), Nima, Odaw, Osu Klottey and Kphesie. Regrettably, some of these streams and lagoons are used as dumping grounds for domestic, human and industrial waste generated within the city. Accra lies in a semi-arid zone characterized by two rainy seasons, a major season covering March to mid-July and a minor one which begins in mid-August and ends in October. The mean annual rainfall is 846mm. Relative humidity varies from 65 percent in mid afternoon to 95 percent at night. Mean monthly temperatures range from a low of 24.7° C in August to a high of 28.1° C in February and March (Amuzu and Leitmann, 1991).

Figure 1.1: Accra Metropolitan Area



I.7.1 Origins and growth

Accra, derived from the Akan word "nkran" meaning "an army of ants" (Tetteh and Botchwey, 1989), was founded by the Gas in the 16th century (Plan Consult, 1989). The city began as three separate fishing villages: James Town, Ussher Town and Osu (Dickson and Benneh, 1970). In 1877, Accra became the capital of Gold Coast, now Ghana, when the seat of the British administration (the sole colonial power) was moved from Cape Coast to Accra. Since then the city has experienced an unprecedented growth in population and area. Before the 20th century, Accra was confined to the coast, between Ussher Fort and Korle Lagoon. Expanded European trading and administrative activities and the establishment of a European residential area, Victoriaborg, led to the physical growth of the center. Around 1908, Adabraka and Korle Gonno, toward the north and west of the original settlement respectively, were created. The incorporation of other settlements notably Osu, Labadi, Teshie, Nungua, as well as the later development of Mamprobi, Kaneshie, Dansoman, Odorkor, Nima and Achimota set the stage for the city's expansion (Fig. 1.2).

1.7.2 Population growth and land-use

The population of Accra grew rapidly from 16,000 in 1891 to 42,00 in 1921, 136,000 in 1948 and 953,000 in 1984 (Odame-Larbi, 1996); at the current growth rate of about 5.5 percent per annum, the population is expected to be more than 4 million by the year 2020 (Environmental Management Associates, 1989).

The growth is attributed to both natural increase and in-migration, which accounts for between 40 and 50 per cent of the total population growth (Anipa and Aryeetey, 1989) (Table 1.1). By 1954, as much as 48 percent of the population was non-Ga. They came from all known ethnic groups in the country and elsewhere (Acquah, 1958) and in 1960, the proportion of non-Gas among the population of Accra was 42 per cent; of these, 73 per cent were migrants (Anipa and Aryeetey, 1989). Migration has continued and still plays a major role in urban population growth, but at present urban growth is mostly attributed to natural increase. In terms of density, the residential areas, which are economically depressed, have densities above 350 persons per hectare and are characterized by high population growth rates. These sectors which include the old indigenous settlements of James Town and Ussher Fort and early settler communities like Nima, Sabon Zongo, Russia, Lagos Town and Sukura. are unplanned, characterized by overcrowding, poor and inadequate sanitation and waste management facilities, substandard housing and generally poor environmental conditions (Asomani-Boateng and Haight, 1998). Classified as low class are areas with densities between 150 and 350 persons per hectare are areas to the north of the city's old core and include neighbourhoods like Adabraka, Mamprobi, Mateheko, Kotobaabi and Abossey Okai. At the other end of the scale are the high class, low density sectors like Roman Ridge, Cantoments, Airport Residential Area, Abelenkpe, North Ridge, North Legon and McCarthy Hill, with low population growth rates and densities of up to 50 persons per hectare, well planned with roads and have access to a wide range of municipal services (Amuzu and Leitmann, 1991).

Table 1.1 Population Growth in Accra

Year	Population	Annual Growth Rate
1891	19,999	-
1901	17,892	-1.1
1911	18,574	0.4
1921	38,049	7.4
1931	61,558	4.9
1948	135,926	4.8
1954	192,047	-
1960	338,396	9.1
1970	636,067	5.1
1984	953,500	3.2

Source: Various Census Reports and Acquah, (1958).

Urban land use in the metropolis is 70 per cent residential, 20 per cent industrial, 8 per cent recreation/open space, and 2 per cent commercial (Republic of Ghana, 1980). Physically, Accra is sprawling beyond all its frontiers with little or no control, resulting in an over-stretched city administration and inadequate urban infrastructural services.

1.7.3 Culture and traditional values

The traditional system of government, based on the institution of chieftancy, has been woven into the modern system of governance, hence indigenous political institutions play an important role in the day to day administration of cities and towns in Ghana. The Ga Mantse (paramount chief of Accra) and his sub chiefs, priests, and clan stool heads are major actors

not only in the political arena of the metropolis but also as mobilizers of development resources.

1.7.4 Socio-economic setting

The metropolitan area dominates the national economy and is the seat of decision-making for all major activities in the country. The 1987 industrial census revealed that 32 per cent of the country's manufacturing industries were situated in Accra. The city sustains major financial institutions, government ministries, parastatals, multinational corporations and other industries. The 1984 census indicated that 26 per cent of the workforce is in the formal service sector, 24 per cent in the wholesale and retail trade, 19 per cent in manufacturing, and 3 per cent in agriculture. Today, however, the informal sector is the main source of employment. Implementation of Structural Adjustment policies and programs by the government, which, among other things, entail the withdrawal of subsidies, job retrenchment and reduction in parastatal activity, result in a significant number of workers in the civil service losing their jobs.

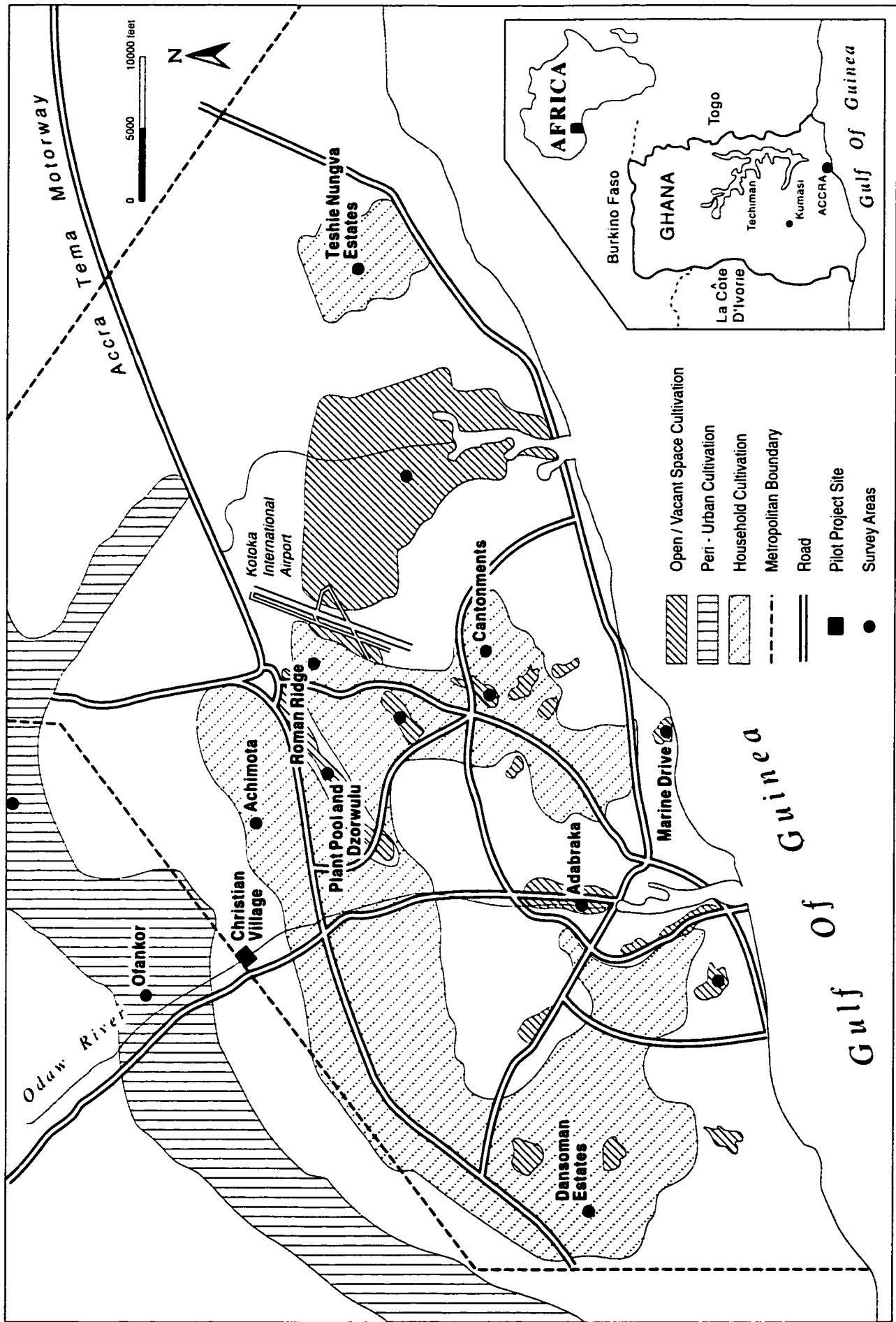
Panford (1994) revealed that between 1987 and 1988, between 4,100 and 4,500 civil servants lost their jobs as a result of the implementation of Structural Adjustment policies. The urban informal sector is the major recipient of these laid off workers, who operate as hawkers, petty traders, food sellers, vegetable growers, and operators of "chop bars" (local restaurants). Though no data exist to indicate the number of urban residents engaged in informal sector activities, the enactment of by-laws to regulate the activities of most street occupations is an indication of the growing importance of the informal sector in the urban

economy. As one participant remarked at a workshop organized by the Ghana Institute of Planners in 1997 on the theme "Decongesting Ghanaian Cities", "Accra is under siege by the informal sector". The informal sector generates significant quantities of organic solid waste and the city authorities cannot cope with its collection and disposal. This is evidenced by piles of refuse found in markets and lorry parks where most of these activities take place. Lardinois and Klundert (1993) revealed that markets and restaurants in the city generate 60,000 cubic metres of organic solid waste each year. A sizable proportion of Accra's population have low incomes; many are unemployed or underemployed. The World Bank study (Norton, 1995) on Poverty in Accra revealed that in 1987 less than 9 per cent of the city's population was below the poverty line; by 1992, that proportion had risen to over 23 per cent.

1.7.5 Urban agriculture

Although agriculture is not officially identified as a major type of land-use within the metropolis, the cultivation of local staples and exotic vegetables, the raising of livestock, snail and mushroom farming, and bee-keeping are common. Food and vegetable cultivation occurs in open spaces in the city within homes, along railway tracks, roads, and drainage channels, and on the outskirts of the city. Cultivation takes place mainly in the fairly extensive open spaces along the Korle lagoon, the Achimota quarry and between Achimota and University of Ghana, south of Accra-Tema motorway industrial zone, Kotoka International airport, Cantonment, Roman Ridge Castle and in pockets all over the expanding northern, western and north eastern parts of the city (Fig. 1. 3).

Figure 1.3: Farming Zones in Accra Metropolitan Area



Cultivation of staples like tomatoes, corn and cassava is a seasonal activity carried out mainly in the rainy season. An all year round cultivation of vegetables like cucumbers, cabbages, lettuce, carrots, sweet peppers, French beans, beet roots and herbs takes place along streams like Odaw near Plant pool, Adabraka-Odawna, Aglogloshie, and Nima creek from Opeibea House to Kaokudi junction near Accra Girls school, Broadcasting and in high and medium class residential areas, where spaces are available for farming and which are also the main markets for such produce (see Fig 1.3). In addition, commercial production of pineapples and mangoes for export is undertaken extensively in the city's peri-urban areas. It is estimated that farmers in Accra supply the city with 90 per cent of its vegetables (Cencosad, 1994).

Extensive use of chemicals and pesticides in vegetable farming and the use of untreated waste water from drains which is often polluted by human, animal and industrial waste poses a major threat to health and environment. Such practices have caused the public to criticize vegetable growers for using such contaminated water in irrigating the vegetables, which they believe make the vegetables dangerous to human health.

The keeping of small numbers of animals like goats, sheep, rabbits, chickens and ducks in the home is a common feature in almost all communities in the city, especially low-income and high -density migrant areas. The commercial production of pigs and poultry for the urban market is undertaken in middle/high- income communities and on the outskirts of the city (Table 1.2).

Table 1.2 Distribution of Commercial Poultry and Poultry Farms in Greater Accra(1997)

Population Range	Number of Farms
< 500	250
501-1000	180
1001-2000	50
20001-3000	4
3001- 4000	-
4001- 5000	1
5001- 10,000	3

Source: Sackey (1998)

1.7.6 Official response to urban farming

It must be emphasized that urban farming in Ghana's urban areas, specifically Accra, was never permitted by the British colonial administrators for health reasons. This trend continued after independence in 1957. Officials of various Town and City councils were instructed to destroy growing crops in the city and animals found roaming the streets, and in some cases, culprits (farmers) were prosecuted for compromising city health. Between 1966 and 1972, government attention focused on increasing rural agriculture; hence many rural-based agricultural projects were initiated to boost food production. Urban farming was not encouraged during this time because the government was hopeful that rural agriculture could satisfy the food needs of the country. And in the name of maintaining urban sanitation, health officials restricted urban residents to the growing of vegetables, and to raising animals that could be easily confined, like poultry, rabbits and guinea pigs.

Operation Feed Yourself Program (OFY)

From 1972 to 1976, the official response to urban farming took another dramatic turn: the government began to tolerate farming in cities and towns in Ghana. This change in official attitude was brought about by a combination of factors. This was a period of harsh economic conditions, resulting from the devaluation of the Ghanaian currency, huge external debts and, later, drought. A major consequence was that supplying food for the country's population became a national issue. Food shortages, coupled with the exorbitant prices of food items especially in cities and towns, became unbearable. A major event that worsened the food crisis was the National Redemption Council's government policy to repudiate all foreign loans and contracts; in what became known as the "Yentua Policy" (We shall not Pay). Under this policy the ruling government at that time refused to pay all outstanding foreign loans, nor would they honor foreign contracts which had been entered into by previous governments.

The international community responded with a boycott of credit and other forms of aid to Ghana. Food aid, for example had always been a major component of the country's food supply was seriously curtailed. Drought conditions prevailed in the country, resulting in poor harvests. The impact of this isolation on the country's food supply was immense. To respond to Ghana's food problem, the government launched the "Operation Feed Yourself" (OFY) programme. Hansen (1987) describes the "OFY" program as "the most ambitious programme to respond to Ghana's food problem". It was a crash program aimed at increasing food production and increasing national self-reliance by encouraging Ghanaians in rural as well as urban areas to grow their own food. Though urban agriculture was not specifically mentioned, this program had a "spill over" effect on urban farming. Urban farming activities

were tolerated and stringent regulations and by-laws which curtailed urban agriculture were relaxed. It gave urban residents the opportunity to farm without fear of their crops and animals being destroyed by city officials. Urban residents were encouraged to farm any available space in the city to increase food supply.

The present government is moving from a position of passive tolerance to one of actively promoting agriculture in cities. A series of initiatives have been undertaken in the Accra Metropolis to accommodate and promote urban farming. These initiatives are examined below.

Institutional reforms

In line with the Central Government's Policy on Decentralization (1992 Local Government Act 462), the Metropolitan Department of Food and Agriculture has been created to manage and promote urban farming in Accra. As a first step the, department has embarked on organizing farmers in the city into farmers' associations, collecting data on the number of farmers in the city, the types of crops grown, the acreage cultivated, and the problems and needs of these farmers. I should point out that the author, while doing his field work in June 1998, was invited by the Metro Director of Food and Agriculture to serve as a resource person to help organize and implement these studies.

Creation of green zones and green belts

To consolidate existing farming areas in the city, the Metropolitan Department of Food and Agriculture has legislated existing farming areas in the city as green zones reserved

purposely for farmers working within these areas, protecting them from encroachment by other urban uses. To respond to the needs of residents who want to farm but do not have access to land, a green belt around the city is to be created where these residents can acquire land to farm.

1.7.7 Political and socio-economic development

Ghana, like many other developing countries, is finding it increasingly difficult to contain its urban growth in terms of both population and physical expansion. The country has passed through an economic decline marked by political instability as evidenced by recurrent coup-detats. Its socio-economic development has been marked by inefficiency, mismanagement, patronage and corruption. Its per capita income, which stood at US\$490 at independence fell to US\$400 in 1980 (The Economist, 1989), a decline of nearly 20 per cent. Inflation, which stood at 0.9 per cent in 1960, shot up to 35 per cent annually between 1970 and 1982 (Werlin, 1991).

Frequent changes in government through military take-overs created political instability and eroded confidence in the economy. Decision making is marked by a "patronage system", linking officials with their tribes, friends and extended families into webs of corruption (Werlin, 1991). The current president of Ghana, President Rawlings, in his 1998 throne speech, admitted that corruption in the country has had a tremendous impact on national development and pledged to root it out. These events have had a substantial effect on the metropolis's development. The absence of effective governmental control has led to a situation in which buildings have sprung up on nearly every vacant site in the city.

Development has occurred and continues to take place in areas prone to floods, and along drainage waterways, open spaces and road reservations, by wealthy people and those who have connections and are in league with public officials to take advantage of weak planning and development controls. Asigbetse (1986) noted that the Convention People's Party (C.P.P.) government in 1964 rezoned an area of 6.6 hectares acquired in 1949 for a wireless transmission station into a residential area and allocated the plots to party activists. Political interference in land-use planning continues to the present time.

1.7.8 Status of the urban environment

This section examines the status of the urban environment, focusing on major environmental conditions in the city. Environmental problems associated with any rapidly urbanizing African city exist in the metropolis. Waste collection and disposal, sewage and sanitation, flooding and deforestation are major environmental problems in the city.

Solid waste collection and disposal

Accra's present population of 1.4 million generates approximately 750 to 800 tonnes of refuse per day and the per capita generation is between 0.5 and 0.6 kg a day (Amuzu and Leitmann, 1991; Armah, 1994). Engmann (1990) indicated a distribution of 0.3 kg per capita per day in low income areas, 0.4 kg in middle class neighborhoods, and 0.6 kg in wealthy areas. The daily generation of solid waste in the metropolis is expected to increase by 3.7 per cent annually. The solid wastes generated consist of organic wastes (68%), inert (22%), plastics (3.4%), paper (4.9%), glass (1.9%), metals (2.6%), and others (2.3%) (Armah,

1994). The main sources of solid waste are residential, commercial (markets, shops, restaurants and hotels), industrial and institutional (hospitals and schools). Restaurants and markets in the city generate 60,000 cubic metres of organic solid waste each year (Lardinois and Klundert, 1993). By weight, domestic solid waste constitutes 85 per cent of the municipal solid waste stream; the remaining 15 percent is accounted for by commercial, industrial and institutional sectors (Asomani-Boateng and Haight, 1997/98).

Critical problems associated with the city's solid waste management practices centre on collection and disposal. Waste collection coverage is grossly inadequate. It is estimated that only 60 percent of waste generated in the city is collected and disposed of (Armah, 1994). The Waste Management Department estimated in 1992 that 35,000 houses in low and medium income residential areas of the city did not have access to waste collection (Songsore, 1993). As a result, waste is left uncollected, dumped into drainage channels, open spaces and water bodies, creating serious environmental and health problems.

Current disposal practices - open dumping and burning, are problematic. There are more than 100 dumps scattered throughout the city and the co-disposal of hospital, industrial, and household wastes into these dumps causes serious health and environmental problems. Hazardous industrial waste and pathogenic waste generated by hospitals, primary health care centers and dental and veterinary clinics enters the municipal waste stream because there are no appropriate measures for its collection and disposal. The city's "landfills" are poorly managed and their location in built-up areas, without any proper management procedures to manage leachate, surface runoff, odors, landfill gas, and the practice of setting these dumps on fire for the purpose of reducing waste volumes, results in the pollution of the urban

environment and constitutes a potential health risk to the city's residents. Added to the disposal problem is the fact that finding new dump sites is becoming increasingly difficult, due to both land shortages within the city and to public opposition.

Sewage and sanitation

Regarding sewage and sanitation, the average volume of sewage in the metropolis is 0.74cubic metres capita per day in high income areas and 0.19cubic metres in other areas (Amuzu and Leitmann, 1991). A very small number of households in the city are served with water-borne sewerage systems as reflected in the types of toilet used. Benneh et al. (1993) notes that 16 per cent of Accra's households use flush toilets, 31 per cent pit latrines, 10 per cent Kumasi Ventilated Improved Pit latrines (KVIP), 20 per cent pan latrines and about 3 per cent do not have access to a toilet at all. Inadequate sanitary facilities leads to overcrowding of these facilities, which creates serious sanitation problems for most residents in poor and high density sectors of the city. Crowding leads to deterioration of toilets as evidenced by the prevalence of dirty floors, flies and open defecation. Residents in low income, high- density and peri-urban areas defecate in open spaces, watercourses and on beaches, and it has been shown by Benneh and others (1993) that the high prevalence of childhood diarrhea and cholera in low income and high density areas is associated with crowded sanitary facilities and open defecation.

Flooding

Flooding is a major problem in Accra and six principal flood prone areas in the city have been identified. These are:

- Panbros salt ponds
- Dansoman-Mpoase- South Odokor- corridor
- Dansoman-Sukura- Chokor- corridor
- Mateheko, Abossey Okai- Korle lagoon corridor
- Alajo-Abeka-Achimota
- Odaw-Dzorwulu-Awudome- Industrial Area- Nima

Inadequate, undersized drains, the physical obstruction of drains by refuse, the low elevation of Accra, rapid urbanization, and the destruction of natural wetlands, coupled with widespread rains characteristic of the May- July wet season, are major factors responsible for flooding in Accra. Some of the most serious floods occurred in 1963, 1973, 1986 and 1995, which destroyed roads, bridges, and industrial estates, and loss of life.

Deforestation

The harvesting of wood fuel for domestic use has contributed to the destruction of indigenous forests, which has led to increased erosion, reduced recharge to ground water, and loss of topsoil, all of which reduce agricultural productivity (Amuzu and Leitmann, 1991). Presently, the dominant vegetation in the metropolis is coastal scrub and savannah. The Achimota forest reserve is the only kind in the metropolis, and encroachment by residential development has led to the size of the forest dwindling from 74 hectares in 1969 to about 36.5 hectares in 1991 (Amuzu and Leitmann, 1991).

Given the numerous problems in the city, the next phase of my discussion will focus on how these problems are being managed, focusing on institutions, policies, programs and regulations involved in and for managing the metropolis environment.

1.7.9 The setting for environmental management

Good environmental management can only be achieved through appropriate institutions and the implementation of feasible and pragmatic policies and programs. Society responds to problems through institutions ranging from households, kinship networks, community-based groups, private enterprises to non-governmental organizations. Such institutions can be part of the problem or part of the solution; hence, the role of existing institutions needs to be carefully examined.

Within the metropolis, a host of institutions including central government, district/local government institutions, the private sector, community-based organizations, NGOs, and households are involved in the management of the metropolitan environment (See Table 1.3).

Table 1.3: Urban Environmental Management Institutions

AGENCY	FUNCTIONS
<p><u>Central Government</u> Ministry of Finance and Economic Planning</p> <p>Ministry of Local Government</p> <p>Ministry of Minerals & Natural Resources</p> <p>Ministry of Industry Science & Technology</p> <p>Ministry of Transport and Communication</p>	<p>-Responsible for resource allocation for research into environment related issues -Execution of environmental action plans.</p> <p>-Coordination of regional district and local level activities and guidelines on environment.</p> <p>-Oversees the exploitation of Ghana's natural resources -Formulation of policy guidelines to ensure prudent utilization of these resources to avoid environmental degradation.</p> <p>-Formulates policy and screens requests for the establishment and siting of new industries to ensure environmental safety.</p> <p>-Responsible for controlling and containing air pollution through the formulation and implementation of policies</p>
<p><u>City Level</u> Accra Metropolitan Authority</p> <p>Waste Management Department</p>	<p>-Responsible for managing the city of Accra</p> <p>-Responsible for the management of solid and liquid waste, management of public places and street and drain cleaning in Accra.</p>
<p><u>Community/Neighborhood Groups</u> Nima 441; La Mansokpee; Kuniyar Nasara</p>	<p>-Involved in clean ups and sanitation campaigns within their neighborhoods</p>

The Environmental Protection Agency is the central coordinating agency on environmental issues but intersectoral coordination is problematic. There is no coordination between most

of these agencies and decision making among the three tiers of government is "top down". This has resulted in overlap of responsibilities and duplication of functions and absence of public participation in environmental matters.

1.8 Policies and Programs on Urban Environmental Management

In the metropolis quite a number of programs and projects have been initiated to improve some aspects of the city's environment. These are examined in the next section.

1.8.1 Integrated municipal program for Accra city transformation (IMPACT)

The "Integrated Municipal Program for Accra City Transformation" (IMPACT) initiated in 1984, was to transform the city of Accra into a real "modern" city. It was an environmental program intended to make Accra clean and healthy. The nucleus of the program was the beautification of Accra, which involved the restoration of heritage buildings, and the elimination of undesirable environmental and health problems by getting rid of wayside fitting shops, derelict vehicle bodies, and unauthorized kiosks and enclosures on public spaces. Accordingly, 137 kiosks and unauthorized structures littering certain ceremonial roads were demolished. A critical component of this program was the provision of efficient and effective waste management services in Accra. To this end the Waste Management Department was created to manage the city's waste.

The Accra Rehabilitation Program (ARP) initiated development programs, resource mobilization, and property valuation/revaluation. Under the development program initiative, the refurbishing of existing major markets and car and lorry parks, the provision of parking

spaces, landscaping and the creation of parks and lawns, the building of schools, the rehabilitation of existing roads and the construction of new ones were undertaken. On resource mobilization and property valuation/revaluation, it must be emphasized that the Valuation Division of the Ministry of local Government was in arrears of properties to be valued and those already valued were undervalued, resulting in loss of revenue to the Accra city council.

With World Bank assistance-training of technical personnel and the provision of equipment, the city's properties were valued. Revenue amounting to 1.1 billion cedis (1,600 cedis is the equivalent of 1 Canadian dollar at the time of the survey) was realized and used for development projects and the provision of social services.

Accra sustainable project

Urban planning, development and management of the city have been tackled under the country's Economic Recovery Program (ERP). A separate management program implemented in three phases: Urban I, Urban II, and Urban III, were introduced between 1985 and 1990. Urban I was mainly concerned with gathering data and documents about the urban economy. Urban II involved detailed studies of different sectors of the urban economy; land, vehicular traffic, infrastructure, population, housing, land-use and planning. These studies culminated in the preparation of a new structure plan for Accra in 1991, setting the framework for the development and growth of Accra. The planning period was 1993- 2010, to be executed in phases of five- year development plans.

The objectives of the plan were to:

- **guide the future physical, social and economic development of the nation's capital city over a long period;**
- **improve the environmental management of existing urban areas;**
- **generate sufficient information for research and public policy on matters affecting urban and regional development;**
- **coordinate the development efforts of the central government, local government, service agencies and the private sector;**
- **allocate resources for urban development, utilities and other services, according to stated and agreed priorities;**
- **provide a framework for monitoring, controlling and adjusting programs in response to changing circumstances (Strategic Plan for Accra Metropolitan Area, 1991, Vol. 3).**

Emphasis has now shifted from purely physical planning to an integrated planning based on economic, social, political and organizational considerations.

1.8.2 Regulatory framework for environmental management

Many legal enactments and by-laws exist which empower various official bodies to exercise executing powers as far as the management of the environment is concerned.

Town and country planning ordinance (CAP84)

In the area of settlement planning, key legislation consists of the Town Ordinance of 1892 (CAP 86) and the Town and Country Planning Ordinance of 1945 (CAP 84), which deal with planning, development, improvement and management of human settlements. The problem with this legislation is that local authorities are not directly involved in policy

formulation, and it does not provide for the effective coordination of activities of the various relevant agencies like the Ghana Water and Sewerage Corporation, Ghana Highways Authority and Electricity Corporation of Ghana, and consequently has resulted in a number of coordination and planning problems.

NRCDC 239 1974

The Environmental Protection Agency under Section 2(1) of the National Redemption Council Decree (NRCDC) 239 of 1974 is designed to ensure the observance of proper safeguards in the planning and execution of all development projects, including those already in existence that are likely to interfere with the quality of the environment.

Accra metropolitan By-Laws on environmental management

The above review concerns national legislation on environmental management; the AMA have in place by-laws for managing Accra's environment. These by-laws focus on sanitation and solid waste management.

The AMA Solid Waste Management By-Law enacted in 1991 is the principal by-law governing waste management in the Accra Metropolitan Area. Section 51(1) of the Local Government Law 1988 (PNDCL 207) establishes the Waste Management Department (WMD) of AMA, or its registered authorized agents or contractors, as responsible for solid waste management within the metropolis. Part III of the by-law entitled "Disposal," specifies that "Every household, industry, office and other premises shall make their solid waste

available to the WMD or its authorized agents or contractors". Part IV states that "solid waste made available by owners or occupiers of premises shall be collected, treated and disposed of at designated sites by the WMD". Part VI of the by-law specifies standard waste containers approved by WMD for the storage of waste in homes and offices; Part VII empowers the WMD to prescribe fees to be levied on users of its service, are offenses.

The by-law identifies the following as constituting an offence: (a) indiscriminate dumping of solid waste in open spaces, drains, gutters and other unauthorized places; (b) failure to provide standard containers; (c) refusal to allow the WMD and its agents or contractors to collect solid waste from one's premises; (d) failure to pay for services rendered by the WMD, its agents or contractors, for three months consecutively.

Where a person commits any of the above stated offenses, whoever is involved shall be liable to a fine not exceeding 50,000 cedis or a term of imprisonment not exceeding six months, or both.

Section 296 of Accra city council cleansing by-law and Act 29 of the criminal code of Ghana entitled "Throwing of Rubbish in Streets" specifies that "whoever does any of the following acts shall be liable to a fine not exceeding fifty pounds". Offenders would be anyone who:

- (a) "in any town, places, or causes or permits to be placed, any filth, dirt, refuse, or rubbish, or any offensive or otherwise unwholesome matter on any street, yard, enclosure or open space, except at such places as may be set apart by the local authority or the health officer for that purpose"
- or (b) "in any town commits a nuisance in any public place or open space, or in any place being an appurtenance of or adjoining a dwelling house".

These acts and by-laws seem to suffer from non-enforcement, given that sanitation and solid waste are still some of the major problems facing the city's municipal authorities, and various programs and projects designed to improve the urban environment have not had the desired effect, specifically solid waste management; an open admission by the WMD in 1994 that "we can't cope with Accra's refuse" (Ghanaian Times, April 22, 1994) is an indication that Accra's waste management problems still remain critical. This is supported by the fact that the newly appointed mayor of Accra in 1998 called the six sub-district heads in the metropolis to an emergency meeting to discuss and find solutions to the city's solid waste management problems (Personal communication, 1998).

The ineffectiveness of regulations and by-laws stems from the fact that they have become outmoded and are out of touch with current realities taking place in the metropolis and penalties against those who flout these regulations are so small that they fail to serve as a deterrent. Added to these is the lack of resources and the will to secure enforcement.

Accra metropolitan by-laws on the growing and sale of crops

According to the by-laws of the Accra Metropolitan Assembly (Growing and Sale of Crops) of August 4, 1995, "No crops shall be watered or irrigated by the effluent from a drain from any premises or any surface water from a drain which is fed by water from a street drainage", and furthermore, "A person who contravenes these by-laws commits an offence, and is liable on summary conviction to a fine not exceeding 100,000 cedis, or in default of the payment of the fine, to a term of imprisonment not exceeding three months, or both."

This by-law is designed to protect urban consumers against bacterial gastro-intestinal infection but the problem is that it is not enforced, and given AMA's staff constraints, it would not be possible to enforce it. Also if it were strictly enforced, it would diminish the supply of the vast majority of the city's vegetables, which are mostly grown within the city with waste water as a major source of irrigation (Amar-Klemesu, et al., 1998).

1.9 Conclusion

The steady recovery of the economy since the launching of Ghana's Economic Recovery Program will accelerate the process of urbanization in the city, ultimately increasing Accra's population. The high population will pose a great threat to the city's environment, putting enormous stress on the city's already overstretched infra structural services. High numbers of people will result in increased solid waste quantities generated and a greater demand for food. Urban agriculture as an informal sector activity will continue to play a major role in the urban economy, since it will absorb significant numbers of urban residents who are unemployed or underemployed.

The metropolis is confronted with a host of social, economic and environmental problems and concerted efforts are being made to address these problems. What is missing is a program and the ability to tap into resources which already exist in the city (waste and urban agriculture). The political will and commitment exists, as evidenced by the present government's effort to promote urban farming and to address waste collection and disposal problems in the city of Accra. Promoting the concept of waste reuse in urban agriculture will help to address major urban problems like poverty, waste management unemployment, food

security and land management. The thrust of this research is to develop a framework linking urban farming and organic solid waste recycling/composting in a strategy to address waste collection and disposal problems in Accra and other Sub-Sahara African cities.

Chapter 2

ORGANIC SOLID WASTE REUSE, RECYCLING AND URBAN AGRICULTURE IN AFRICAN CITIES

2.1 Introduction

This chapter surveys the body of cumulative research on municipal solid waste management and urban agriculture in African cities in order to identify major gaps in scholarly activities in these areas to whose resolution future research efforts should be directed. The studies selected for citation are the ones which are most useful in contributing to an understanding of the theme of this research. Preference is given to the most recent and accessible studies. The review is organized in four parts. The first part discusses problems of municipal solid waste management in Sub Saharan African cities and examines solid waste management research, programs and projects undertaken on the continent. The second deals with urban agriculture, its evolution, present status and other related issues. Gaps in research from the review of Municipal Solid Waste Management (MSWM) and Urban Agriculture (UA) are identified. The third section examines the concept of Waste Reuse Urban Agriculture: its nature, practices, issues and problems. The fourth part considers the concept of organic solid waste recycling, emphasizing ways of retrieving the organic fraction of the Municipal Solid Waste (MSW) stream and the problems of organic solid waste recycling.

2.2 Municipal Solid Waste Management Problems

Across Africa the major task of providing municipal solid waste management services is the responsibility of municipal governments, although efforts have been made by some municipal authorities to privatize the collection of waste, as is the case in Ghana (Armah, 1994; UNEP, 1996), Nigeria (Cointreau, 1994), the Ivory Coast and Senegal (Obeng and Cointreau, 1997), Botswana (Dohrman, 1991) and Kenya (Regional Housing and Development Office, 1991). As a result, cities in Africa have an established waste collection system carried out by human and animal drawn carts (wheelbarrows and pushcarts), open back trucks, compactor trucks and trailers. On average, the collection rate across the continent is around 40 to 50 per cent (Obeng and Cointreau, 1997; UNEP, 1996) and an overwhelming majority of disposal sites are open dumps, many of which are not well-managed, with some located in densely-populated and ecologically-sensitive areas. The ineffectiveness of the existing conventional approach, which has limited goals of collecting, transporting and disposing of the wastes out of sight of the city residents is widely known (Kulaba, 1988; Mbuyi, 1989; Bertolini, 1992; Syagga, 1992; Bushra, 1992; Obeng and Cointreau, 1997; Asomani-Boateng and Haight, 1997/98). This is evidenced by mounting heaps of garbage found in open spaces, which block streets and choke drains, and which are periodically set on fire. These ineffective solid waste management practices create serious environmental and health problems. Given their failure, studies and projects have been and are being undertaken to find solutions to waste management problems in African cities.

2.3 Municipal Solid Waste Management Research

Improving collection rates in African cities has been the main thrust of MSWM studies. Pfammatter and Schertenleib's (1996) study on non-governmental refuse collection in Douala, Cameroon, Abidjan, the Ivory Coast and Ouagadougou, Burkina Faso, identified problems of waste collection and attributed them to irregular secondary collection, low participation of households in waste collection, very poor salaries for collectors, and the inaccessibility of some areas to waste collection vehicles. This study concluded that small private enterprises and community groups have great potential for improving waste collection and recommended collaboration between municipal authorities, non-governmental organizations, community groups and other major actors in waste management decision-making. Equally important was the selection of appropriate, affordable and sustainable technologies. Obeng and Cointreau's (1997) assessed Bamako's (Mali) pre-collection project and noted that transferring to municipalities, municipal solid waste collection and allowing community women's groups and micro-enterprises to provide pre-collection services proved successful and self sustaining, with pre-collection costs covered by direct user fees from households. Studies in Nairobi, Kenya by Mbugua (1980) and Mabuba (1991) recommended appropriate housing design to locate collection points or transfer stations within residential estates in order to facilitate solid waste collection by the Nairobi City Council. Mbuyi (1989) noted in Kinshasa, Zaire that the failure of the city's waste collection is due to the absence of viable roads, and suggests that the provision of minimal covered roads was a primary condition for improving solid waste collection. A UNDP/World Bank (1991) study on performance assessment of the solid waste collection services in Zimbabwe and Uganda

revealed that the productivity of waste collection vehicles is low and indicates that although the informal sector is actively involved in the recycling of wastes, only a small percentage of the waste resources is recovered. The study recommended government interventions like environmental taxes, licenses and raw materials restrictions to stimulate the informal recycling sector. In Benin, Nigeria, Agbonifo (1982) identified the ineffectiveness of the city's waste collection system as resulting from too few and poorly designed vehicles and suggests the use of handcarts to collect refuse from inaccessible areas of the city and manual labour to level landfill sites. In Lagos, Nigeria, Asade (1991) recommended recycling of the organic fraction of the municipal solid waste through mechanized composting to reduce waste disposal problems. He also suggests the use of railway and barge transportation to move solid waste from the capital to disposal sites in other areas of the territory.

Studies and projects on privatization of municipal solid waste collection are being pursued vigorously in Africa. Privatization has become the political creed of the 1990s and governments in African countries are now turning to privatization as a way to help address shortfalls in urban infrastructure services. Privatization initiatives in solid waste collection services in Africa typically involves one or more of the following:

- zonal franchises with private companies;
- a city-wide contract with one private company for collection, transfer and disposal of residential, commercial and institutional waste;
- neighborhood contracts with cooperatives and micro-enterprises for solid waste pre-collection;
- a zonal contract with a private company for solid waste collection (Cointreau, 1994).

Solid waste composition, volume and generation rates studies have been documented in the literature. In Kigali, Rwanda, Bertolini (1992) drew attention to the predominance of organic and inert matter which constitutes between 92 and 96 per cent of the total domestic waste stream. Yhdego (1992) noted that two-thirds of the waste from Kariokor market in Dar-es-Salaam, Tanzania consists of vegetable matter, while in Kampala, Uganda 75 per cent of waste generated is organic (ILO/UNDP, 1991). These studies recommended that household waste be either recycled into compost or used as fodder for pigs, goats, sheep, cattle and rabbits. Yhdego (1985) revealed that in Tanzania, the lack of reliable data on waste volumes and composition hinders the development of an efficient urban solid waste management strategy.

Studies focusing on institutional and technological issues have also been undertaken (Hayuma, 1983; Yhdego, 1985; UNCHS, 1989; Dohrman et al., 1991; Tevera, 1991c; UNDP/World Bank, 1991). Tevera argued that progress in improving solid waste management in Zimbabwe calls for policy and regulatory reform and institutional development. Inadequate financial resources constitute a major institutional constraint facing municipal solid waste management in African cities (Tevera, 1991c). Segosebe and Van Der Post's (1991) study on solid waste management in Botswana demonstrated that the absence of a well-coordinated institutional framework for solid waste management which, coupled with poor legislative provisions and a lack of specific regulations governing the handling and disposing of wastes and the inadequate enforcement of regulations, are limitations to the provision of an efficient and effective municipal solid waste management service. A study done by Environmental Resource Ltd (1990) in Ugandan cities noted that the poor status of

waste management in these cities results from the absence of a central body entrusted with the responsibility of managing waste. The provision of waste management services is fragmented over various departments, with no department specifically charged with the responsibility for the overall development, planning, and coordination of various waste management activities.

The urban structure of most African cities has been found to pose a major limitation to municipal solid waste collection. Mabogunje (1990, 1992) described the colonial urban planning of African cities as "racist in orientation and segregationist in practice," and characterized by what Swanson (1979) termed the "sanitation syndrome" of European colonialism. This syndrome, Swanson noted, was influenced by public health theories of disease and was deeply-rooted in Europeans' fear of being "infected" by Africans (Mabogunje, 1992). To avoid being infected by the African, European residential areas, usually referred to as "the white-man's paradise in Africa," were separated from African areas by a "cordon sanitaire" of open spaces, parks, wood lots, race courses, green belts and railway lines (Wekwete, 1989; Mabogunje, 1992)¹. It must be stressed that while the British were more inclined to promote physical segregation along racial lines, the French, through their policy of "assimilation," preferred segregation on the basis of culture (Njoh, 1997). Thus, Gallicised indigenes were actually accepted in French circles and could in fact live

¹ In Accra, this is evidenced by the location of the former race course site, which provided a buffer between Ridge Residential Area (formerly European Residential Area) and Osu to the east. To the west, the land stretching north from Accra Polytechnic to the Holy Spirit Cathedral, covering an area of 20.84 hectares was acquired for a building free zone. To the north an area of 118.35 hectares was acquired for dairy farming. The purpose of these acquisitions was to separate the European Residential Area from African settlements at Adabraka and Labedi.

alongside French colonial officials or immigrants, while in Anglophone Africa, no matter how Anglicized a native became, living with the English was never permitted. Such segregationist urban development concepts were widely adopted and served as the basis of colonial urban planning across Africa (Balbo, 1993; Simon, 1989; Drakakis-Smith, 1987; King, 1974).

A dual urban structure of African and European sectors emerged. The former, now occupied by the African elite, is well planned with open spaces, parks, and access roads which facilitate the motorized collection of waste from these areas. The African sector, with its own form of traditional planning based on kinship and community cohesion, has led to compact communities or neighborhoods. Since walking was the dominant form of transportation, narrow and winding footpaths have been the only forms of access to these areas. The impact of such a transportation structure on the delivery of modern infrastructure facilities is immense. These narrow winding roads and footpaths hamper the swift collection of waste by sophisticated, huge compaction and trailer trucks.

Informal sector resource recovery and recycling studies have been undertaken in Botswana, Tanzania and Zimbabwe (Yhdego, 1988; Kulaba, 1989; Tevera, 1989; 1991b; 1993; Dohrman et al., 1991; Gould, 1992). These studies revealed that waste pickers operating on the lower rungs of the waste recycling industry are very poor and live in deprived conditions. Waste picking is seen as a survival activity engaged in by unskilled and illiterate urban residents. These studies revealed that waste pickers in Harare's Teviotdale dump are perceived as deviants who blight the urban landscape and hence should be relocated to rural areas. Vogler (1987) identified five categories of metal recyclers in Nairobi, Kenya:

drum workers, cold workers, lamp makers, black-smiths and machine workers who recycle metals into lamps, drums, washing bowls and heavy-duty bicycles.

In West Africa, Asomani-Boateng and Haight (1998) noted that in Accra, recycling and reuse of waste materials are practised extensively in the city by waste pickers who retrieve plastic containers, glass bottles, paper products, and cardboard boxes, clean them and sell them to artisans who turn metal scraps, tires and tin cans into lamps, cooking stoves and pots, watering cans and sandals. Waas and Diop (1993) observed in Dakar, Senegal, that waste recycling is a very organized activity employing between 2,000 and 2,500 urban residents. These recyclers turn waste materials into cooking pots, kettles and boards, and point out that low incomes coupled with high taxes and stiff competition from imported commodities, are the major constraints they face. In Bamako, Mali, Diallo and Coulibally (1991) revealed that waste recycling is an important activity, offering employment to a significant number of unemployed urban residents who maintain cottage industries located in so-called "car cemeteries," turning scrap metals into kitchen utensils, toys and farm tools. The recycling of agro-pastoral waste in the form of groundnut shells and cotton trash into oil cake for use as fodder for cattle is undertaken. Market gardeners who farm on Bamako's 1550 hectares of cultivable land make extensive use of household and pastoral refuse.

2.4 Urban Agriculture in Africa

Urban farming in African cities is complex and diverse. It involves the cultivation of food and non-food crops, animal husbandry, including livestock, fowl and fish within (intra)

and on the fringes (peri) of built-up areas of the city (Ganapathy, 1983; Mougeout, 1994) (Table 2.1).

Table 2.1: Urban Agriculture (Farming System Groups)

Horticulture	Aquaculture	Livestock	Orchards/ Woodlots
Vegetables ornamental plants and other crops in/on:	Fish, shrimp, seaweed, duckweed, etc. in:	Micro - (guinea pigs, rabbits, poultry), larger animals in/on;	Fruit, other plants and fuelwood in/on:
-backyards -rooftops -vacant lots -community gardens -roads & waterways -grounds of public & private institutions -suburban farms -garbage landfills	-rivers -ponds -coastal bays sewage lagoons	-backyards -rooftops -roadside -suburban farms -parkland -urban forests	-vineyards -parks -institutional grounds -roadside -backyards -hedgerows

Source: J. Smith and A. Ratta, in *Hunger Notes*, Fall, 1992, p. 8.

2.4.1 History and status of urban agriculture

Historically, urban farming has been a major activity in African cities since pre-colonial days and according to Winter (1983), in a hot, often humid region such as Tropical Africa, the problem of storing food was added to the problem of transporting it were reasons for cities to be self sufficient in food.

Agricultural activities have influenced and determined urban land use and the morphology of cities in Africa. Cities such as Kumasi in Ghana and the Yoruba towns of Western Nigeria were surrounded by a zone of intensive farming in which the majority of

residents worked each day (Bowditch, 1819; cited in Winters, 1983). The fact that urban farming constituted an activity in which a significant number of the population in pre-colonial African cities participated is one of the reasons why these cities were classified as non-urban (Bascom, 1955), and hence referred to as a "group of villages" (Winters, 1983). Urban cultivation played a more important role in Eastern and central African cities. The quarters of these cities were separated, and the space between them used for farming (Winters, 1983). As an observer said of Kampala, "it was less of a city than an immense garden" (Gutkind, 1963). The capital of Lang. in Congo was so green that an eighteenth century missionary remarked that "a missionary who was a bit nearsighted could have traversed the whole town without seeing a single house" (Balandier, 1956).

Colonial administrators' response to urban farming in African cities could be described as negative and hostile, reflected in colonial urban planning, which was grounded in the context of modernizing African cities by removing any vestiges of "backward" and "filthy" activities; urban cultivation was seen as a manifestation of rural habits or "a remnant of bush life", as Naipul (1981) described it. The colonizers who controlled African cities had "concepts of grandeur, precepts of cleanliness and a firm intent to distinguish themselves from the bush" (UNDP, 1996). Consequently, urban cultivation and the rearing of animals were not permitted. Colonial administrators thought urban farming would compromise town and city health and distract the so-called "natives" from working in the emerging formal economy. In addition, it was assumed that since rural agriculture could provide for the food needs of towns and cities, cultivation in cities was not necessary. The only plants that urban residents were permitted to grow were ornamental plants, plants that could beautify African cities and towns.

Urban farming in contemporary African cities is largely unrecognized and unassisted, and in some cases outlawed because of the hazards associated with it. Furthermore, urban farming is seen as not conforming to zoning regulations, because in planning African cities, colonial administrators ignored urban cultivation, and "there has been a remarkable continuity from colonial practice in this sphere across the continent" (Simon, 1979). Contemporary urban planners and city managers tend to associate development and modernization with industrialization, and hence ignore farming in urban areas, viewing food production as being "external to cities" (Guyer, 1987) and "real agriculture" as taking place in rural areas (Drescher, 1994). Subsequently, hostility and repression have confronted the activities of urban farmers in a host of African cities. In Bamako, Mali, the authorities banned the cultivation of cereals in 1989 on the grounds that the tall stalks provide hiding places for bandits (Diallo, 1993). Kenyan authorities viewed urban cultivation as a blight on the urban landscape, and in Zambia the harsh repression of urban cultivation in the 70s and 80s was justified on the grounds that urban farming facilitated the breeding of malaria-carrying mosquitoes (Rakodi, 1988).

Despite the official neglect from the colonial period to the present day, however, it is clearly apparent across contemporary Africa that urban farming is widespread and is becoming a permanent feature of the landscape of many African cities. Proof of its persistence and stability is reflected in the acreage of land farmed within and around the built-up space of African cities, and by the number of urban residents engaged in urban agriculture.

A significant proportion of urban land in African cities is being cultivated (Mosha, 1991). In Dar-es-Salaam, Tanzania, satellite imagery has revealed that 23 per cent of the

metropolitan area is used for agricultural production; nearly 3,400 hectares are devoted to crop production, with vegetables accounting for 500 hectares (DSM/ARDHI, 1992). Elsewhere, in Harare, Zimbabwe, land under cultivation increased from 5,000 hectares in 1990 to 9,000 hectares in 1993, representing between 15 per cent and 20 per cent of the city's total area (Mbiba, 1995). In Daloa, Ivory Coast, land under cultivation increased from 52 hectares in 1954 to 624 hectares in 1988 (Mougeot, 1994). An increasing number of urban residents are engaged in urban agriculture: two thirds of urban Kenyans are farmers (Mazingira Institute, 1985; Freeman, 1991); in Accra, Ghana, Amuzu and Leitmann (1991) estimated that 3 per cent of the city's labour force is engaged in urban farming, including fishing, and 90 per cent of the city's vegetable supplies including radishes, cabbage, and cauliflower, are supplied by urban farmers (Cencosad, 1994). The words of the Accra Metropolitan Authority (Tetteh and Botchwey, 1989) revealed the importance of urban agriculture in the city: Subsistence farming manifests itself in nearly every home and any unused space in the city. Vegetables and food crops which are commonly planted combine effectively with poultry, piggery and fish farming to supplement the income of the metropolitan dweller.

The stability of urban agriculture in African cities can be explained in terms of the tenancy habits of urban cultivators. The widely held notion of urban farming as a marginal, temporary activity undertaken by transients and recent migrants has been disproved. Sanyal's study (1984) of urban farmers in Lusaka, Zambia, revealed that 60 percent of households who cultivate "on plot" gardens have lived in Lusaka for more than 5 years, with an average duration of residence of 7.3 years. Regarding rainy season gardens (peri-urban or "off" plot

garden), 45 per cent of the farmers did not cultivate during the first 10 years of their stay and 75 per cent did not cultivate during the first 5 years. Lado (1990) found in Nairobi, Kenya that the average residence of urban farmers was 20.4 years; and Tricaud's survey (1987) of one hundred gardeners in Freetown, Sierra Leone and Ibadan, Nigeria, and Sawio's (1993) study in Dar-es-Salaam, Tanzania revealed similar findings. It is not the case, then, that urban agriculture is temporary; for as other researchers have found, idle space in the city is and always has been cultivated. In situations where plots undergo rapid renewal as a result of urban growth and increases in land values, the farmer adapts by moving his or her occupation to another location. The farming operation does not cease, but adapts and moves in response to changing conditions (Smit et al., 1996; UNDP, 1996).

In Dar-es-Salaam, urban farming is the largest employer in the city, engaging 11 percent of the total urban population (Bureau of Statistics, 1988). In Lusaka, Zambia, urban farming is so extensive that the city has been described as "the world capital of urban cultivation" (Sanyal, 1984).

The foregoing discussion establishes the fact that urban farming is an age-old activity in African cities which is continuing to expand. Current conditions prevailing in African countries, including rapid urbanization, ineffective agriculture policies, crippled domestic food distribution, constrained government spending, the removal of subsidies, wage cuts, soaring inflation, rising unemployment, natural disasters, and civil strife will likely accelerate the growth of urban farming (Mougeot, 1994). A growing number of African countries have recognized the importance of urban farming and have taken steps to incorporate urban agriculture in their city plans. The new national capitals of the Ivory Coast, Malawi and

Tanzania have been planned to accommodate urban agriculture (DGIP/UNDP, 1992), and local governments in Maseru, Lesotho (Greenhow, 1994), Kampala, Uganda (NIEC, 1994) and Dar-es Salaam, Tanzania (DSM/ARDHI, 1992) have commissioned special sectoral studies on urban agriculture as part of their master planning process.

2.4.2 Urban agriculture research and studies in Africa

The literature on urban agriculture in African cities indicates that most of the studies have been conducted in eastern and southern African countries: Zambia, Kenya, Tanzania, Ethiopia, Uganda, South Africa and Mozambique (Sanyal, 1985; Lee-Smith, 1987; Rakodi, 1988; Freeman, 1991; Maxwell and Zziwa, 1992; Sawio, 1993; Mbiba, 1995; May and Rogerson, 1995). Quite a few have focused on West Africa: Sierra Leone, Cameroon, Guinea Bissau, Nigeria and Ghana (Tricaud, 1987; Ngwa-Nebasina, 1987; Lorenzo Linden, 1995; Lewcock, 1995; Amar-Klemesu and Maxwell, 1998). Most of the initial studies focused on aggregate food supply and estimates of the overall quantity of food produced in cities as evidence of the contribution of urban agriculture to food security (Sanyal, 1985; Mvena et al., 1991). Mougeot (1994), reviewing urban agriculture in Africa, noted that the nutritional impact of urban agriculture is an understudied area. He also pointed out that urban farming as a basic urban function is not new to Africa but has grown into a complex and thriving business which is not marginalized to a particular social group but undertaken by the poor, the rich, the unemployed, the educated and the uneducated alike. He concluded that farming in African cities is a major source of employment as shown by the significant number of urban residents involved.

Studies by Sanyal (1984), Rakodi (1988) in Lusaka, Zambia; Maxwell and Zziwa (1992) in Kampala, Uganda and Eghziabher (1994) in Addis Ababa, Ethiopia revealed that urban agriculture is a survival strategy for poor urban residents. Mvena et al. (1991) and Briggs (1989, 1991) observed that in Dar-es-Salaam, Tanzania, urban residents not only farm to survive but also for the lucrative commercial opportunities urban agriculture offers. They noted that in Dar-es-Salaam's low-density open spaces, chicken and livestock rearing is thriving because of the commercial value of such products as eggs, meat and milk.

Mwangi (1995) compared farming and non-farming households in low income neighborhoods of Nairobi, Kenya, and noted that while mean consumption is well below estimated requirements in both cases, farming households were better off in terms of both energy and protein consumption, and that households engaged in farming were significantly better off in both categories. The farming households produced between 20 per cent and 25 per cent of their food requirements and were less dependent on gifts and transfer. Mwangi concluded that urban agriculture had a positive impact on household food security and nutritional status and stressed that direct support for urban agriculture can increase the impact. Maxwell, Levin and Csete (1998) revealed that urban agriculture is positively and significantly associated with higher nutritional status in children, particularly in terms of height and age, and there is a significantly lower proportion of moderately to severely malnourished children in households where someone is farming. They concluded that the impact on nutritional status is the result of both higher and more stable access to food due to virtually year round availability of staple foods from urban food production, and the ability of mothers who farm to provide more direct child care than women engaged in other economic activities.

Engle, Menon and Hadad (1996) revealed that urban agriculture, unlike other female income-generating activities, gives mothers time to care directly for young children while at work, and care is a crucial determinant of child nutritional status (Maxwell et al., 1998).

Lado (1990) noted, in Nairobi, Kenya, that negative official attitudes to urban farming are changing, as evidenced by the relaxation of zoning and municipal regulations. Mbiba (1995) and Aipira (1995) pointed to the general alienation of urban agriculture. They noted that urban farming is considered illegal; hence those involved are subject to sporadic harassment by urban authorities. Sawio (1994) emphasized that city administrators' attitudes towards urban agriculture in Africa is mixed; few planners and decision makers see urban farming as a worthwhile and legitimate activity. To the traditional urban planner, the architect, the politician and other decision-makers, urban agriculture contravenes the common image of the city; it detracts from the images of the "ideal planned and modern western city". To many it is a remnant of an outmoded transitional activity typical of rural living where people handle dirt (Sawio, 1995). In Lusaka, Zambia, Wade (1987) pointed out that severe economic crisis led to the official recognition and encouragement of urban agriculture. As early as 1977, President Kaunda appealed to Lusaka residents to help ease the country's economic crisis by growing more of their own food. Under the country's policy of "Eat what you grow and grow what you eat", the Zambian government instructed urban councils to help residents find land for food production.

Studies by Vennetier (1961), Sanyal (1985), Lado (1990), Drakakis-Smith (1992) and Sawio (1993) have collapsed the common hypothesis that urban farmers are recent migrants to the city who cannot find jobs. Lado (1990) noted that 85 per cent of Nairobi farmers had

resided in the city for at least 5 years, 57 per cent had lived in the city for more than 15 years and 15 per cent had lived in the city for more than 40 years. Egziabher's (1994) study in Addis Ababa, Ethiopia and Tricaud's survey of one hundred gardeners in Freetown and Ibadan showed similar findings. Egziabher revealed that the movement into urban agriculture may happen later, after an initial stage in the process of seeking options in the urban economy. Urban farming has been undertaken by households as a final stage in their sequence of survival strategies. Virtually all previous studies on urban farming concluded that urban agriculture is largely an activity of women. From slightly over half of those engaged in the practice to nearly 100 per cent of participants have been found to be females (Maxwell, 1995; Sawio, 1993; Freeman, (1991). Sawio noted that farming covers the entire range of urban socio-economic and ethnic groups.

In West Africa, Diallo noted that urban agriculture has an important impact on food security and nutrition, though he is not able to substantiate his point with any studies. He pointed out that the increase in urban farming activities in West African cities is due to the unfavorable international macro-environment, climatic factors, poverty, urbanization and unemployment. He drew attention to the links between urban agriculture and the environment, and noted that reduction in land, water, good sanitation and technology are major constraints to the development of urban agriculture. In Cameroon, Ngwa Nebasina (1987), revealed in his study of Buea Town Gardeners that "urban dwellers including civil servants and their dependants have discovered the small scale potentials that urban land provides". Ngwa Nebasina identified two types of land ownership: land used by full-time farmers and that used by part-time farmers; he also pointed out that farming in Buea town by

civil servants was due to the availability of continuous out-of-office hours. His analysis showed that urban residents farm because of the desire to increase their families' food supply and also as a recreational activity with no serious commercial motivation.

Streiffler (1987) cites several studies on urban agriculture. She cites Lassere (1958), who pointed out that in Libreville, Congo, in 1957, 80 per cent of farmers were women. Adrien-Rongier (1980), Streiffeler reports, revealed that during the last years of the Bokasa regime in Bangui (Central Africa) many of the residents and prisoners in the city survived only because of the gardening efforts of local women. Mbuyi (1989) observed that in Kinshasa, Zaire, with the expanded population of the city, the provision of food has been critical and urban agriculture has increased as a possible solution.

Maxwell and Amar-Klemesu (1998) noted that two major constraints face urban agriculture in most African cities: the first is the legal and regulatory frameworks of the cities which often prohibit farming activities within the urban area; the other is access to land. While many of the by-laws regulating urban agriculture date from the colonial era, present municipal leaders hesitate to change such laws, though occasionally, in times of crisis, these strict regulations are overlooked and not enforced. It seems that in general, urban agriculture faces much fewer objections and obstructions in African cities than it did decades ago (Amar-Klemesu and Maxwell, 1998). Land rights, land values and its taxation, and land delivery systems have been a major source of difficulties for urban administrators in African cities, and the use of land for relatively low value agricultural production has been vigorously opposed by land use planners. The result is that much of the land used for urban farming is informally or illegally accessed; hence the cultivator has few rights (Maxwell, 1996). Land ownership

issues, along with other legal and regulatory and political impediments to urban agriculture, as examined above is echoed by Homer-Dixon (1999) in his thesis of “Structural Scarcity”. Homer-Dixon’s concept emphasizes that, scarcity is caused by a severe imbalance in the distribution of wealth and power that results in some groups in society getting a disproportionately large slice of the resource pie, whereas others get slices that are too small to sustain their livelihoods.

2.5 Solid Waste Management and Urban Agriculture Research in Accra, Ghana

Enough has been alluded to the problems of municipal solid waste problems in Accra in Chapter 1, section 1.7.8, of this thesis. This section reviews solid waste management and urban agriculture research undertaken in Accra.

Hueber’s (1992) study on Hospital Waste Management in Accra, which focused on the management and technical treatment of infectious components of hospital waste, revealed that hazardous medical waste, which presents a high risk to humans and the environment, is generated by large and small health facilities, and industrial and research facilities. He identified the lack of a legislative framework, guidelines, effective control, education and training of staff, and the improper handling of waste within and without hospitals as major constraints militating against effective management of hospital waste in Accra. The study recommended the implementation of appropriate legislation to regulate hospital waste within and without health care institutions, and the provision of an appropriate infrastructure to treat hospital waste. Kramer et al. (1993) revealed in their study of municipal solid waste characteristics in Accra that the city’s population of 1.4 million generates 607 tons of

municipal solid waste every day, with per capita generation of 0.43 kg. Organic and inert matter constitutes 90 per cent of the municipal waste stream, while plastic, glass, metal, paper and textiles account for the remaining 10 per cent.

Asomani-Boateng et al's. (1996) examined the feasibility of community composting as a strategy to supplement Accra's overburdened conventional approach and revealed that community-based composting is technically feasible as a solid waste management strategy and noted that the lack of knowledge about composting, the uncooperative attitude of waste management officials and the unavailability of space to compost are major constraints to decentralized composting. An assessment of a waste collection project using farm tractor and trailer initiated by the city's WMD reveals that solid waste collection from high and medium-density residential areas has improved the door to door collection rate in areas of the city which have narrow and poor road conditions (Obeng and Cointreau, 1997).

In Accra there have only been three studies on urban agriculture to date. A study conducted by Amar-Klemesu and Maxwell (1998) is the most recent and detailed work on urban farming in the Accra metropolis. This study provided a descriptive analysis of urban agriculture in the city, discussed the impact of urban agriculture on food security and nutrition, provided environmental assessment of urban agriculture in the city, discussed food contamination arising vegetable production using waste water, and finally reviewed changes in land rights and livelihoods in peri-urban Accra. The study revealed that while urban agriculture is predominantly a women's activity in many Sub-Saharan African cities, over 60 per cent of farmers in Accra are men, and farming in the city is motivated by the need for cash income, food and assets which can be readily liquidated into cash in emergency situations. It

also noted that there is relatively little evidence to indicate that there is a positive impact of urban agriculture on food security and nutritional status, and there is no positive association between urban farming and child nutritional status. Among the beneficial environmental impacts of urban agriculture is the potential to recycle urban waste, but the study did not indicate how this can be achieved. The study revealed that the improper use of agricultural chemicals in densely populated areas creates run-off hazards. It also noted that vegetables irrigated with tap water have a lower bacterial count than those irrigated with wastewater, and a major source of contamination appears to be in marketing, handling and the distribution system. It also revealed that while low numbers of households within the city are engaged in urban farming, agriculture constitutes the backbone of the city's peri-urban economy, and emphasizes that urban sprawl is putting an enormous strain on agriculture as the primary livelihood of peri-urban farmers. This study recommended changes in land use planning to accommodate urban farming and to protect agricultural land from urban sprawl.

Cencosad's (1994) study, which focused specifically on urban market gardening in the Greater Accra Metropolitan Area, revealed that 90 per cent of the vegetables consumed in the metropolitan area are produced by farmers within the metropolitan area. The study indicated that it was mainly wealthy consumers who benefitted nutritionally from this production. However, it was mainly low income migrant workers who engaged in vegetable farming, and thereby benefitted in terms of livelihood. Within the metropolitan area, urban farming helps to stabilize stream banks and keep drainage channels open (Cencosad, 1994). This study also revealed that virtually everyone engaged in market gardening is male, whereas women tend to dominate urban agriculture in other cities in Sub-Saharan Africa. Kufogbe

(1996) noted that urban sprawl in the Greater Accra metropolitan Area is having a considerable impact on contiguous peri-urban areas, resulting in the conversion of agricultural land to residential uses, and suggests the need to institute urgent and stringent measures to protect peri-urban agricultural land.

2.6 Gaps in Research

The review clearly shows that in the area of municipal solid waste management, areas best researched include: (i) waste characteristics and generation rates; (ii) informal resource recovery, which focuses on dry recyclables; (iii) collection and disposal; (iv) institutional aspects, and; (v) constraints which impede the efficient delivery of municipal solid waste management services. Aspects which have not been researched, but which require in-depth studies include: (i) organic solid waste recycling, and; (ii) reusing organic wastes in urban farming in African cities.

Urban agriculture research has focused on: (i) impediments and constraints to urban farming; (ii) the economic and social contribution of urban agriculture; (iii) motives for farming; (iv) issues centering on who cultivates and their socio-economic characteristics; (v) constraints to urban agriculture; (vi) factors contributing to the resurgence of urban agriculture in African cities; and finally (vii) official attitudes to urban farming. Areas that have not been studied include: (i) the environmental and health impacts of urban agriculture; (ii) legal aspects of urban farming; and (iii) the recycling of organic solid waste into urban agriculture. Almost all the studies done emphasize the complementarity between municipal solid waste management and urban agriculture, and call for the need to integrate the two as

an urban management tool to address the issues of waste management, food, employment, and poverty in African cities. It is obvious from the above review that waste reuse in urban agriculture is under-researched in Africa; the paucity of systematic information for African cities is notable. Remarks made by these well-known researchers reinforce the need to link urban farming with municipal solid waste management in African cities:

Urban agriculture provides scope for transforming urban settlements into self-sufficient entities moving towards a closed system. Instead of churning out effluents, it provides opportunity for recycling organic solid waste and waste water and reclaiming land thus becoming an effective and productive way of waste management in cities (Chimbowu and Davidson, 1993).

Urban governments have concentrated on landfills as the major means of waste disposal. It is time city governments recycle waste by composting and integrating this with urban agriculture. More research is needed to design programs which will help citizens to safely separate waste into compostables and non compostables (Sawio, 1993).

The question is, how do we link municipal solid waste management with urban agriculture in the cities of Africa? What framework or model can we use, and are frameworks or models available? The answer to the last question is no. It is thus appropriate at this time to undertake a major study of how to integrate municipal solid waste management and urban agriculture through organic waste recycling. The discussion which follows examines the concept of reusing waste in urban farming.

2.7 Waste Reuse Urban Farming

The combination of urban agriculture and urban organic waste is being strongly promoted as an urban management strategy to address major urban problems of waste disposal, poverty, food security and environmental degradation. Since the organic

fraction of municipal solid waste in African cities is relatively high (ranging, for instance between 80 and 90 per cent),the management of organic solid waste will have a significant impact on urban waste management. Discussions of urban agriculture frequently point out that city farming could absorb substantial quantities of solid waste, thus reducing the volume of waste and the need to collect and transport waste to dumps. The question is, is the practice of reusing waste in farming new to African cities?

The practice of reusing waste in farming in African countries is not new. Most African countries have traditionally utilized and continue to use various types of organic materials to maintain and improve the productivity, tilth and fertility of agricultural soils. The indigenous kitchen, compound, and community garden systems practiced in rural and small townships of West Africa make extensive use of organic materials (Asomani-Boateng and Haight, 1998).

Kitchen gardening, which involves the cultivation of a small parcel of land within the home or living compound because of its proximity to the home, makes use of household organic refuse, manure, and other organic waste materials to ensure continuous cultivation. Crops grown are those frequently required by the kitchen or household of the operator.

With the compound farming system, the land immediately surrounding the compound is intensively cropped with vegetables and staples using organic soil regeneration techniques involving the use of household refuse and manure from livestock. Among the Kwahu's of southern Ghana, a portion of the land surrounding the compound is allocated for dumping organic solid waste from the household, which mainly consists of food and kitchen waste and manure from chickens and livestock raised by the household. Dumping continues for at least two years and is left for a year to undergo anaerobic decomposition. This piece of land,

usually referred to as *sumina*², is used for the cultivation of okra, tomatoes, peppers, maize, cocoyams and plantains.

The community gardening system, like the compound system, is practiced in rural and small urban communities in Ghana. Within each neighborhood, locations are selected for residents to dump their household waste. Dumping continues until the space is used up; a new site is then selected. The old dump is left idle to decompose, and after two to three years can be farmed by any member of the community. These dumps are also mined for compost which is either sold or used for gardening. When I was in primary school in my native village of Mpraeso, Ghana, on every Friday the students were required to send to school "*black soil*" (compost mined from abandoned waste dumps) to be applied as fertilizing material on our school gardens.

In Tamale, Ghana, farmers use night soil, organic waste from cotton ginneries, abattoirs and household waste to fertilize their fields. There is such a high demand for organic waste that farmers are known to hijack government trucks that empty septic tanks, pay the drivers 2,000 cedis and direct them to their farms and let the night soil pour over their fields. About 90 per cent of the town's night soil is used as fertilizer by farmers (Owusu-Bennoah and Visker, 1994).

The application of animal manure, combined with compound waste in the Kano closed settled zone in Nigeria (Bache and Harris, 1994; Harris, 1994; Mortimore, 1993) and the Mossi plateau, Burkina Faso (Prudencio, 1993) and Machakos, in Kenya (Tiffen et al., 1994),

² abandoned waste dump

to fertilize agricultural fields, is a common practice which has gone on for centuries. Lewcock (1995) and Mortimore (1993) observed that the use of *taki*³ as fertilizing material by Kano's peri-urban farmers to regenerate the soil and to ensure continuous cropping is a common practice. Mortimore (1993) revealed that in 1969 and 1972, 1137 and 1447 donkeys respectively carried *taki* out of the old walled city of Kano to its peri-urban farmers. This represented between 140 and 1180 tons of compost per day for peri-urban farms. It is estimated that in a 7.5 km radius, 25 per cent of the fertilizer needs of the farmers were met by waste from Kano at an average application of between 3.25 and 5 tons per hectare per annum (Mortimore, 1993).

It must be emphasized that colonial and post-colonial authorities refused to take note of how the African farmer did manage his/her land through the use of indigenous farming practices, including the use of waste in cultivation. Such practices were regarded as inefficient and backward; hence the adoption of western agricultural practices, including the use of chemical fertilizers, hybrid seeds and machines which focused on increased production. The reuse of waste in urban agriculture activities, which were considered filthy and a potential health risk, have not been promoted in Africa's urban areas, places which are supposed to be symbols and show-pieces of modernity. Lately there has been a resurgence in organic waste reuse in farming in Africa's urban and rural areas. Farming on old garbage dumps, what Faired (1990) has termed "garbage farming", and the use of food waste generated from homes, restaurants and canteens as fodder for pigs, goats, sheep and cattle, is common in African

³ compost from manure, household waste, street sweepings and ash

cities. Table 2.2 summarizes the main practices of waste reuse in urban agriculture (WRUA) in African countries

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Table 2.2 : Main Practices of Urban Organic Waste Reuse in African Countries

Type of Waste	Waste Composition	Practices	Comments
Kitchen, restaurant, and canteen food waste	Raw peelings and stems, rotten and fresh fruits and vegetables, left-overs	-Food waste used as fodder to feed animals -deposited on neighborhood dumps for animals to forage -sold to commercial farmers within the city and in peri-urban areas of the city	Direct feeding to household livestock is low-risk; where the waste is mixed with other household hazardous waste it poses a potential risk to livestock
Mixed municipal waste delivered to centralized composting plants	Institutional, industrial, market and household wastes: broken glass, plastic film, batteries, human excreta, biomedical waste and waste from veterinary and health clinics	-Compost is sold to large scale farmers -used in municipal parks and golf courses	Most centralized mechanized composting plants have either failed or are operating at low capacities ; Compost is expensive and of low quality due to contamination
Old and abandoned garbage dumps	Well-decomposed after several years of undergoing anaerobic decomposition, it consists mainly of organic wastes and very little non-compostable waste (i.e., synthetic materials) since most of the dry recyclables have been recovered by waste pickers	-Mining for compost from old and abandoned dumps -Farming on these dumps is common	Farming on old dumps may be low- risk in terms of infection
Market Waste	Fresh and rotten vegetables, fruits, food, meat and poultry products, animal carcasses	-Used as fodder for livestock, - and deposited near markets, which eventually turns into a mountainous heap of garbage.	Places where sanitation is poor defecation is common, serve as breeding grounds for rats and snakes. Since these dumps are not policed they serve as hideouts for drug dealers, thieves and armed robbers.

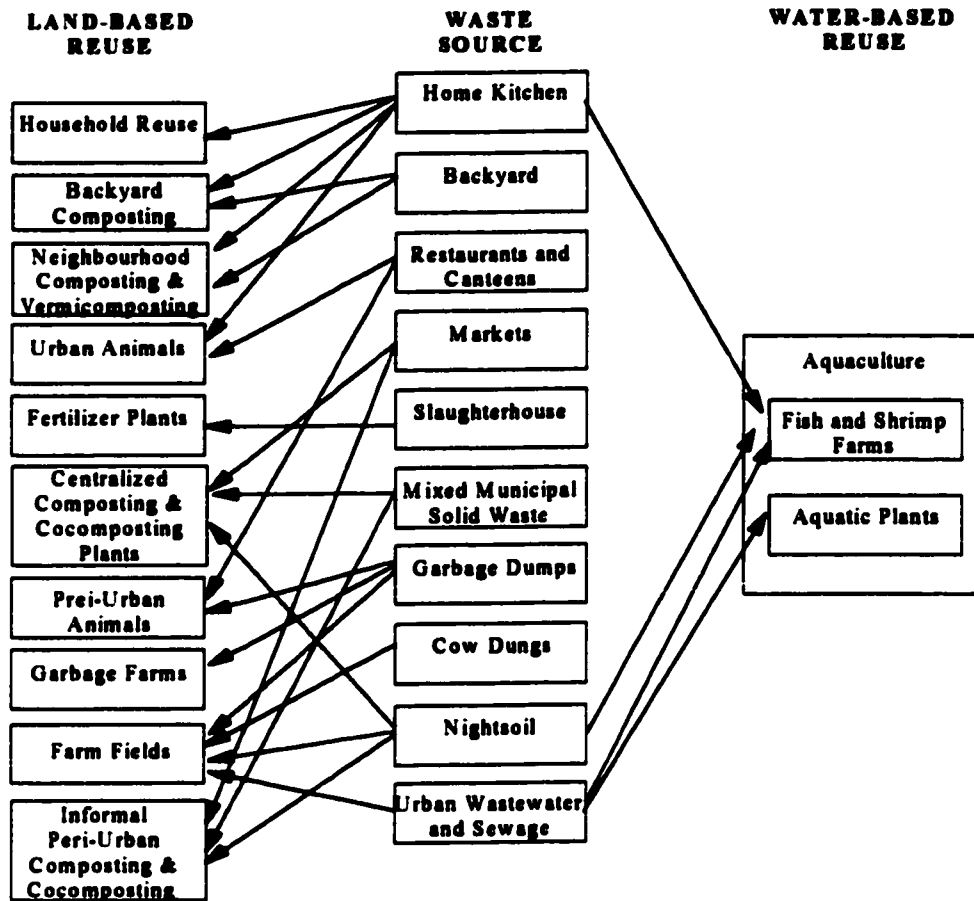
Table 2.2: Main Practices of Urban Organic Waste Reuse in African Countries (continued)

Type of Waste	Waste Composition	Practices	Comments
Cow, goat, sheep and pig manure and chicken droppings		composted with sawdust and agricultural waste and ploughed into the soil	
Waste water	Wastewater	use to irrigate crops, especially vegetables. Most of the time it is untreated	Constitutes a health risk to farmers and consumers of vegetables, since it is contaminated with human excreta, industrial and other forms of hazardous waste
Human excreta/nightsoil	Human waste	Used to fertilize agricultural fields, usually untreated; co-composted in centralized plants	Constitutes a potential health hazard to farmers and consumers

Source adapted from Furedy et al, 1997, pp 3-5

The high cost of chemical fertilizers and the growing awareness that organic matter is indispensable to keep the soil productive have generated this renewed interest in organic waste reuse urban farming; across Africa various waste reuse systems are in place (Fig. 2.1).

Figure 2.1. Organic waste reuse systems



Source: Faired et al (1997)

At this point one may be tempted to ask, if waste is already being recycled into urban agriculture in African countries, why then the need for this research? Tolerating waste reuse urban farming is not enough; there is still ample scope for reuse as an urban management strategy, and since there is no stated policy on waste- reuse urban farming, there is a need to develop strategies and frameworks to promote and encourage this practice. The good news is that the culture of waste reuse exists in African countries. What is needed is for city authorities to adapt, develop and manipulate this old practice to advance and promote waste reuse urban agriculture as a sustainable urban management tool.

2.7.1 Issues

When waste is reused for agriculture and aquaculture especially, all the risks of handling and processing these wastes may be present (Table 2.3). Both the workers who are directly exposed to solid waste and wastewater in processing or farming and consumers of waste-nourished food are subject to what Smith (1988) has called "the risk transition". Fears about disease and injuries are major limitations on Waste Reuse Urban Agriculture (WRUA), and such concerns always come up in discussions on waste reuse (see Edwards, 1990, 1996a; Lardinois and van de Klundert, 1993; Allison and Harris, 1996; Furedy, 1996; Smit et al., 1996; Hart and Pluijmers, 1996; Cointreau-Levine et al., 1997). The fundamental issue of health was brought up by the Ad Hoc Panel of the Advisory Committee on Technology for the Board on Science and Technology for International Development of the National Research Council (USA) in 1981 in which it was stated that the strongest negative factor in the use of human and animal wastes for the production of food, feed or fertilizer is the possibility of

disease transmission which would negate the gains derived from the use of waste. It is important to emphasize that health is a critical issue in waste reuse urban agriculture in African cities since urban solid wastes generated in these cities contain large quantities of pathogens due to the presence of human excreta, and the application in farming of such wastes can pose a significant health risk.

Municipal authorities in Africa are not happy with the idea of allowing urban farming in their cities, let alone embarking on wholesale promotion of waste reuse urban agriculture. City officials perceive these activities as being "inappropriate" in a modern city. The planning of African cities has been influenced by the "City Beautiful" concept, which emphasizes aesthetics, efficiency, hygiene and modernity (UNDP, 1996). In countries with a colonial history, which almost all African countries have, the European concept of the city as a planned "civilized space" has been adopted and guides the planning of African cities to date. This view holds that space in the city can only be used for recreational gardens, forests and neat lawns, and not for food cultivation and urban waste recycling, activities considered unhygienic and a potential health hazard (UNDP, 1996). Waste in any form should be trucked out of the city and out of the sight of city residents. In situations where city authorities allow these activities, they are not officially sanctioned and promoted; consequently there are no coherent policies or strategies to promote and develop waste reuse urban farming.

Where Municipal governments decide to promote organic waste reuse, as has been the case in Nigeria, Ghana, Senegal and the Ivory Coast, the approach adopted has so far ended in failure. Highly-mechanized centralized composting plants to recycle organic waste into compost have been built, but have failed due to poor marketing, the poor quality of

compost resulting from the contamination of the end product (because management systems usually do not sort the organic from the inorganic and the toxic from the nontoxic), and the commitment to high-tech mechanical composting plants which constantly break down, and which are expensive to procure, operate, manage and maintain. Centralized systems hinder the reuse of organic waste by urban agriculture because waste is collected over large areas and dumped unsorted at a few major, often distant sites, while at the same time farmers who are supposed to benefit from the compost are scattered or dispersed all over the city, as is the case in Accra, Ghana.

The production costs of and market for compost determine the long-term sustainability of waste reuse urban agriculture. Production cost is affected by such factors as land prices, the generation of waste in sufficient quantities in accessible locations to be worth collection, the degree of contamination, and the technique of compost production (mechanized or labor-intensive). The market for organic wastes will depend on such variables as the cost of transportation from the production site to the place of use, labour costs of production and distributing the organic waste at the farm site and the comparative cost of substitutes. In those African countries which have adopted mechanized composting plants to compost waste, the compost produced tends to be very expensive compared to artificial fertilizers. There is a huge potential market for compost in African cities, but the problem is that marketing strategies to promote the sale and use of compost are lacking. Most of the time farmers who are supposed to benefit from the compost are not even aware of the existence of the compost plant. The quality of compost is also an important factor to be considered when marketing compost, and

good quality compost can be produced by reducing the level of contamination through source separation.

Table 2.3: Health Risks of Waste Reuse in Urban Agriculture

<p>Some of the main risks associated with the reuse of human excreta and solid wastes are:</p> <ul style="list-style-type: none">• Direct contact diseases: the transmission of pathogens, viruses, parasites through mouth, feet, nose, e.g., enteric infections, helminthic infestation, skin ulcers, water-borne disease for sewage-fed fish farmers• Air pollutant diseases: caused by bio aerosol, particulates, methane, carbon dioxide, volatile organics, e.g., chronic bronchitis, chronic cough, headaches, cancer• Vector-borne diseases: from flies and mosquitos breeding in poorly managed compost piles, e.g., dengue fever, hanta virus,• Animal feeding disease links: food chain path of transmission, e.g. enteric infections, whip worm infestation, "mad cow disease" linked to slaughterhouse wastes• Crop contamination disease links: food chain path of transmission e.g., diarrhea from fecal matter in wastewater irrigation, cancers from heavy metal take up by crops via soil or wastewater• Injuries: from sharp wastes including glass splinters in compost, collapse of waste piles in compost

Source: Cointreau-Levine, Listorti and Furedy, 1997, p. 8

Urbanization and industrialization affect the potential for waste reuse for urban agriculture. Urban sprawl which results from urbanization contributes to the loss of agricultural land, since agricultural uses are converted into residential, commercial and

institutional uses. And since agricultural activities are pushed further to the urban fringe, the number of nearby farmers who need waste to recycle into farming reduces. At the same time, the distance between users of organic waste and the generators of waste increases, leading to high transportation costs which constrains the reuse of organic waste in urban farming. The most serious implication of urbanization and industrialization for waste reuse in urban agriculture is contamination of the organic waste stream. Contamination of the organic waste stream makes it difficult and sometimes impossible to reuse organic waste, due to the fact that it will not be technically feasible to sort out the contaminants, or it will be extremely expensive to do so. High levels of air pollution resulting from high concentrations of lead from vehicle exhaust also contaminate crops grown along roads.

2.8 Organic Solid Waste Recycling

Reusing and recycling urban organic solid waste can take a variety of forms. Organic solid waste may be reused as fodder or fuel or recycled into compost, and the compost produced used as soil conditioner in crop cultivation. Against the background of waste reuse urban farming, specifically food crop and vegetable cultivation, composting constitutes a vital link between organic solid waste reuse and urban agriculture. The question is, why is composting so critical to waste reuse urban agriculture?. It has been demonstrated in this chapter that a major constraint to reusing waste in urban farming is the potential health risk associated with this practice. Composting eliminates or reduces any potential health risks to farmers and consumers arising from the presence of pathogenic micro-organisms associated with reusing untreated organic waste in urban agriculture. The high temperatures of between

55° C to 70° C normally reached in a compost heap effectively kill most of the pathogens whose presence poses a risk.

Composting projects can be categorized according to the scale of production (large, medium, small and micro) and the source of waste input (household, neighborhood and city). Medium and large-scale composting plants obtain their garbage from location throughout the city, while small-sized neighborhood projects receive their waste from the neighborhood in question.

City composting plants in African cities involve composting waste materials in large-scale highly-mechanized composting facilities, often managed by city authorities or municipalities. In Senegal, the Ivory Coast, Ghana and Nigeria during the 70s and 80s, city authorities opted to build complex, centralized plants to recycle the organic fraction of the municipal waste stream. These plants are either out of operation or have been scaled down and many operate well below their planned capacities. According to Oluwande (1984), the multi-million naira composting plant completed in Lagos, Nigeria in 1979 was never commissioned because the operating cost of 20 million naira per annum was considered unreasonably high. Asade (1991), after conducting a study of the plant, concluded that the compost project failed due to the adoption of inappropriate technology, characterized by imported mechanical and electrical parts which were too expensive to replace or too difficult to maintain, as well as a failure to conduct economic and financial appraisals.

Ngom (1989) revealed that in Dakar, Senegal, a compost plant constructed at a cost of 200 million francs in 1979 to recycle 150 - 200 tons of household waste a day closed down due to constant equipment breakdowns, and an inadequate market for the compost produce.

In Accra, Ghana, the Teshie Nungua compost plant, originally designed to process 200 tons of waste, has failed to meet its production targets due to mechanical failures, and despite a reduced capacity of 35 tons per day using a modified process, the plant is still beset with a host of problems and in 1998, under the government's privatization policy, is slated to be sold. Asomani-Boateng (1994) revealed that the failure of the plant is attributable to high construction and operating costs; constant breakdowns, a lack of equipment, the absence of technical knowledge and skills to operate and maintain such an over-sophisticated facility, and diversion of the plant's equipment by politicians to perform private jobs.

It has to be pointed out that the success of centralized compost plants depends on the presence of an efficient solid waste collection and transportation system in the city, since the wastes have to be collected all over the city and sent to the composting site. Inadequate fleets of collection vehicles and the poor state of roads in most African cities are major constraints facing municipalities who have installed centralized compost plants. There are problems in offsetting the high costs of transporting the waste to the plants, and in marketing the finished compost, which is expensive and low in quality. These problems are often exacerbated by the fact that municipal authorities fail fully to investigate potential markets for compost before installing such plants, and when they are installed, fail to market the compost. Nevertheless, the high proportion of organics in the municipal waste stream which retains the interest in composting urban wastes in African cities seems to offer a feasible way to substantially reduce waste volumes.

Even though household composting is well known in North America, it is not the case in Africa and has not been adopted as a household management strategy by households in low,

medium and high-income neighborhoods, although the practice of using household kitchen waste to feed livestock is common in African countries. A host of factors may contribute to this phenomenon. The lack of space within homes in high-density residential areas makes it utterly impossible to undertake household composting. In medium and high-income sectors, where there is adequate space within homes to allow for household composting, there are house-to-house collection services; hence the need for composting does not exist in such areas.

Neighbourhood or decentralized composting, which depends upon small scale, simple technologies and labour intensive processes, is seen as the most appropriate approach to composting organic wastes in African and other developing countries. With neighbourhood composting, organic waste generated from homes by households within the neighbourhood is conveyed to a site within the neighbourhood and composted using simple techniques like windrows. Such projects are fully managed by the community. In African cities where solid waste collection is inefficient and the costs of waste collection constitute about 50 per cent of the solid waste management budget, decentralized composting, which saves the transport cost of waste collection, seems to be a very innovative approach to urban solid waste management. As a city grows, so do the distances between the areas where waste is generated and the disposal sites; hence transport costs increase and land for disposal becomes difficult to find. Le (1995), using an economic appraisal approach, has shown that in Hanoi, North Vietnam, the disposal costs of composting were almost half those of land filling. Moreover, Asomani-Boateng et.al. (1996), Lardinois and van de Klundert (1994), Furedy (1992) and Arlosoroff and Bartone (1987) have argued that "low tech," small-scale, simple composting operations

can be more profitable than large centralized ones, and more cost effective. There are quite a few small scale composting projects in Africa; some of them are examined below.

2.8.1 Bamako project

In Bamako, Mali small-scale composting is undertaken by GIEBESYA, a micro-enterprise initiative. This enterprise employs young graduates as workers, who collect garbage from neighborhood residents who pay a fee to a composting site. At the site dry recyclables are removed by waste pickers while the organic waste is placed in pits, covered with soil, and left to undergo anaerobic decomposition for several months. The resulting compost is sieved by hand to separate any remaining inorganic items and then sold.

2.8.2 Port Novo project

In port Novo, Benin, since 1989, a small micro-enterprise employing 21 youths processes solid wastes from over 7,000 households in Tohoue into compost. The project was initially funded by the Center Panafricain de Prospective Sociale (CPP), Emmaus International, a French NGO, and United Nations Development Program's Partners in Development. Tractor trailers are placed in certain locations within the settlement for residents to dump household waste. The trailers are towed every evening to a recycling center where the youth sort out the garbage, removing plastics, metal, glass and other items that do not decompose biologically. Metals are sold to blacksmiths, and glasses crafted into jewelry by artisans. The organic fraction is dumped into pits covered with palm fronds and composted. Part of the compost is used on the farms operated by the youths and the rest sold for \$2 a

wheelbarrow to other farmers. Costs are covered through contract payments and revenue from the sale of compost, dry recyclables, and vegetables grown by the enterprise.

In the South African cities of Durban, Johannesburg and Pretoria, there are community composting centers where residents drop off household and garden wastes, which are then composted and sold to gardeners. Peri-urban farmers in Brazzaville, Congo, practise small-scale composting and use the compost on their farms (UNEP, 1996). As with any community-based project, small-scale composting faces all the problems of finding sufficient initial resources, making people understand the need for such projects and sustaining people's motivation, the negative attitude of municipal authorities, achieving stable markets for the compost produced, and finding appropriate sites for composting. Municipal authorities in Africa have not taken the initiative in promoting small-scale composting; rather, the concept is being explored by NGOs, and International Agencies involved in waste reduction. A few experiments, testing the feasibility of small-scale composting, have been undertaken in a few African cities. Some of these experiments are examined below.

2.8.3 Shasha, Ibadan, experiment

Sridhar and others (1985) conducted a scientific experiment on community composting of refuse and abattoir waste as a demonstration to motivate residents of Shasha in Ibadan, Nigeria, to practice community composting on a large scale. Shasha community has a population of 4,800 residents of Yoruba, Hausa, Ibo, Edo and Tiv origin. Farming and trading are the main occupations of the residents. Waste collection and disposal are major problems

as evidenced by the presence of garbage heaps in markets and residential areas. At the time of the study there were 25 large refuse dumps in the community.

Eleven houses selected at random participated in the demonstration project. Occupants of the selected houses were requested to store each day's generated waste in a thick polythene bag. The bags were collected and sent to the laboratory, weighed, and sorted into putrescible and non-putrescible wastes. The procedure continued for a week, after which putrescible waste was mixed with abattoir waste and formed into a compost heap using a simple windrow technique. At the end of ninety days the compost had matured and was ready to be used. Growth experiments on vegetables conducted with the use of the compost showed that compost promoted better growth. However, despite the fact that the experiment proved that composting at the community level using simple composting techniques is feasible, this study did not indicate whether the community adopted community composting as a strategy to address its waste collection and disposal problems.

2.8.4 Aglogloshie, Accra, experiment

Asomani-Boateng (1994) conducted an experiment on community composting in Aglogloshie, a low income neighborhood of Accra, Ghana's capital city. This neighborhood, with a population of 5,000 residents, is located in the city's core. In terms of urban services this community is poorly-served, the city's waste collection services do not extend to this neighborhood and waste generated is left at community dumps and eventually set on fire.

Twenty-two households were selected, and were given a short orientation exercise in source separation. They were then told to separate their household waste into compostables

and non-compostables. The refuse generated by the sampled households was weighed every morning at the project site. All compostables were stored as feedstock for the compost heap and non-compostables were discarded at the dump.

A simple windrow aerobic composting technique was chosen to compost the waste. At the end of the experiment, 150 households had expressed interest in the project and the community leaders decided to continue and expand it. Out of the 793 kg of refuse generated by participants in eight days, 491 kg were diverted from the dump and recycled into compost, indicating that decentralized composting could substantially reduce waste volumes. However, the community could not continue with the project when residents of this community were evicted and the land sold to a multinational company.

2.8.5 Source separation

Source separation, which involves the systematic division of waste into designated categories, is critical to recycling organic wastes into urban farming. Source separation reduces the incidence of contamination resulting from the co-mingling of different kinds of wastes. Few formal systems of material recovery through public agencies or the private sector exist in Africa; however, material recovery, including source separation and recycling, is the domain of the informal sector. The economic and social value of recyclables is the driving force behind resource recovery and recycling in African countries. These activities occur at several levels. At the household level in low-income neighborhoods, resource recovery begins with the reuse of plastic containers, bottles, paper, cardboard and cans for domestic purposes. The rate of reuse in this instance is high and these materials enter the waste stream only when

they are no longer fit for domestic use. In high-income residential neighborhoods, recovery is carried out by domestic servants who retrieve bottles, plastics, cardboard, and paper products and sell them to middlemen or commercial centers that pay for these materials. The extent to which these transactions occur depends on the availability of marketable end uses for these materials. At dumps and landfill sites, waste pickers recover materials which they sell to waste merchants and artisans.

Although there is a great deal of waste recovery and recycling by the informal sector, there is the need for further intervention to obtain pure organics for composting, because the degree of source separation to keep organics pure and thus safe for food production is much greater than what is achieved by the separation of saleable recyclables. Research on source separation in African countries is lacking, but source separation projects in the southeast Asian cities of Bangkok, Bangalore, Shanghai, Jakarta, and Surabaya have all either not succeeded or have encountered problems (Internet conference on source separation, 1997). These pilot projects either asked householders to source-separate a category of wastes (e.g. coal in Shanghai, or organics in Bangalore) or installed street bins with compartments for these wastes, expecting the public to separate these wastes and place them in the required compartment. None of these projects were supported by adequate educational drives explaining to the public about the need and benefits of source separation, and they also lacked community participation.

2.9 Conclusion

Urban and rural communities in Africa have long traditions of resource conservation through waste reuse and organic waste recycling in agriculture. Waste-based food production is an important source of food and provides employment to a significant number of people. Promoting the concept of waste reuse urban agriculture as a sustainable urban management tool in contemporary African cities is constrained by social and economic factors and the process of urbanization. Central to a waste reuse urban agriculture strategy are the concepts of source- separation and composting which are critical to the success of this strategy.

Chapter 3

EMERGING CONCEPTS

3.1 Introduction

This chapter examines concepts relevant to this study. Waste reuse urban cultivation is seen as an effective and sustainable urban development tool. Related concepts are examined in this chapter.

3.2 The Concept of Sustainable Development

Sustainable development is not a new concept. From prehistoric times, different cultures have demonstrated awareness of environmental limits and some have devised successful long-term survival strategies to avoid environmental degradation; examples include "good animal husbandry" (Dasmann, 1985; Pretty, 1990; Harwood, 1990), conserving resources through waste reuse, and waste recycling in agriculture in Africa (Asomani-Boateng and Haight, 1999) and Asia, (Furedy et al., 1997). The need to consider environmental concerns in development was expressed at the 1968 UNESCO (Paris) "Biosphere Conference", at the "Ecological Aspects of International Development Conference" (1968) in Washington, and at the 1972 Stockholm "Conference on Human Environment". Schumacher (1974) in the early 70s emphasized the need to respect renewable resources and the need to modify approaches.

During this time, the Club of Rome initiated debate on the limits to growth (Meadows et al., 1972) which had largely been avoided since Malthus in the 18th and 19th centuries. Prior to the introduction of the concept of sustainable development, there was the concept of ecodevelopment, promoted in the early 70s by Sachs (1979; 1984), IUCN, UNEP and others (Dasmann et al., 1973; Riddel, 1981; Glaeser, 1984; Adams, 1990). Barrow (1995) defines ecodevelopment as "symbiosis

between humankind and environment, if need-be "stretching" resources without damaging them". Ecodevelopment focuses on conservation and the environment, but, as Barrow (1995) argues, sustainable development goes beyond "living within one's environmental means to seek socio-economic objectives - it has a development goal".

The "Brundtland Report" (World Commission on Environment and Development, 1987) put sustainable development into the political and economic arena, rekindled environmental interest that had waned in the mid 70s, and advocated a "new holistic ethic in which economic growth and environmental protection go hand in hand" (Barrow, 1995). The report emphasized the need for both rich and poor nations to protect the environment and reduce poverty. Over the past decade, the concept of sustainable development has been increasingly discussed and debated. It has become a critical component of intellectual and policy debates in both developed and developing countries. Sadler (1990) notes that the concept of sustainable development is widely promoted as the key to unifying environmental and economic interests that have been pursued along separate and usually conflicting paths. He points out that this shift in conventional thinking is problem-driven, and represents a growing concern over the scale of human impacts on the biosphere.

Many definitions and interpretations of the concept have evolved (Clark and Munn, 1986; Brown et al., 1987; Redclift, 1987; United Nations, 1993), but what is clear is that there is no precise universal definition of sustainable development; it is a multi-dimensional concept generated by what Pirages (1994) termed "sustainability problematique" (the realization that the materially comfortable way of life that has evolved in some countries, which many would like to emulate, cannot be maintained globally with predicted future populations and technology).

The WECD (1987) defined sustainable development as that which "meets the needs of the present without compromising the ability of future generations to meet their own needs". The National Commission on the Environment (1993) defines sustainable development as:

a strategy for improving the quality of life while preserving the environmental potential for the future, of living off interest rather than consuming natural capital. Sustainable development mandates that the present generation must not narrow the choices of future generations but must strive to expand them by passing on an environment and an accumulation of resources that will allow its children to live at least as well as, and preferably better than, people today. Sustainable development is premised on living within the Earth's means.

These definitions emphasize certain important concepts and themes. They stress (i) the importance of living within the ecological carrying capacities of the planet (ii) living off the ecological interest, and (iii) protecting future generations. They envision a society that "can persist over generations, one that is far-seeing enough, flexible enough and wise enough not to undermine either its physical or social systems of support" (Meadows et al., 1992). These definitions raise the possibility of a new type of fairness and equality which have not been considered in the past; the issue of intergenerational equity is difficult to achieve and unborn generations cannot make their concerns known. Living in a world that is uncertain and constantly changing, there is some doubt that the present generation can actually plan for the needs of future generations.

Dovers and Handmer (1992) argued that the concept of sustainable development "is so broad and generically applicable that its inherent vagueness renders it inoperative and open to conflicting interpretations". They suggest a "definitional approach" to sustainability and sustainable development. Sustainability is the ability of human, natural or mixed systems to withstand or adapt to endogenous

or exogenous change indefinitely. Sustainable development is therefore a pathway of deliberate change and improvement which maintains or enhances this attribute of the system, while answering the needs of the population. Lele (1991), on the other hand, points out that sustainable development is a doctrine that allows contradictions and inadequacies in policies. Tolba (1984a) remarked that sustainable development has become "an article of faith, a shibboleth; often used but little explained". Others, like Esteva and Prakash (1992) and The Ecologist (1992), characterize the concept as imprecise and lacking in consensus about its meaning, and fear that it is a false flag beneath which lie hidden and unpleasant things.

3.3 Sustainability in the Context of Developing Countries

Most writers on sustainability in developing countries (Wekwete, 1989; Dei, 1993; Akin Aina, 1994; Atkinson, 1994; Brugmann, 1994; White, 1994; Drakakis-Smith, 1995) agree on a common theme. Their main concern is "development", which in the context of developing countries denotes progress towards a decent standard of living for all residents; if such development is to be sustainable, it has to deal with poverty in a way that does not irreparably damage the environment (Chowdhury and Furedy, 1994). Patricia McCarney (1992), in World Cities and Environment, the final report of the Five Cities Consultation Project, wrote:

The first conclusion... is that we cannot talk about the environment without also talking about poverty. In all cities involved in the project, the linkage was clear between economic need and environmental degradation. The poor live in overcrowded housing, located near polluting industries... They usually build their houses informally on marginal lands, often on precarious slopes prone to mud slides or on flood plains. They lack connection to their city's sewage system and they do not have the benefit of municipal collection of solid waste... They have limited choice on where to live, what water to drink or where to bathe; and so they are peculiarly vulnerable to environmental problems.

Poverty and the lack of essential infrastructure, housing and services, including sanitation, waste collection and disposal, are major problems facing residents in cities of the developing world. As Stephen Lewis (quoted in Stren, Whitney and White, 1992) pointed out, "the crux of the debate of sustainable development is how you deal with poverty in human settlements... everything else is academic." Similarly, in the introduction to the issue on "Sustainable Cities", David Satterthwaite stressed that "any consideration of sustainable development and cities in Africa, Asia and Latin America must have the improvement of housing, living and working environment of poorer groups as a central focus".

Dei (1993) criticized sustainable development, questioning the appropriateness and applicability of the concept in the context of Africa. He argued that "sustainability" is a concept framed within a Western mode of thought for non-Western people. And the concept of development, he pointed out, is relative; it has come to mean different things to different people, and hence sustainability must be viewed in the context of a peoples' culture, history, local skills, ethnoecology, local ecosystem and their role in nature (Sachs, 1987; Matowanyika, 1989).

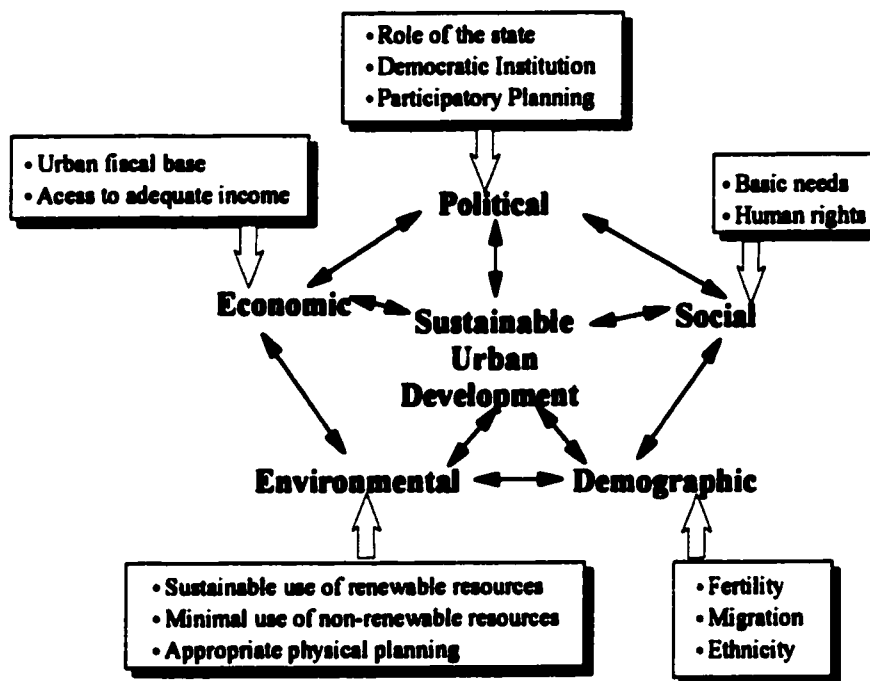
3.4 Sustainable Urban Development

Urbanization is seen as a major contributing factor to the worlds' environmental problems (Simmons, 1989, 1991; Elliot, 1994). Whitney and White reinforced this point by pointing out that contemporary cities have spread beyond their "carrying capacity", as they draw resources from very wide areas and in return pollute the immediate surroundings with waste. Living conditions for most residents in cities of the developing world, especially Africa, are appalling. Most African cities are

sites of squalor, poverty, unemployment, crime, drug abuse, political domination, human rights abuses and tremendous environmental and health hazards (Aikin Aina et al., 1994). Hence, sustainability in the urban context as postulated by Drakakis-Smith, (1995) should address and resolve the problems of (i) equity, social justice and human rights; (ii) basic human needs; (iii) social and ethical self determination; (iv) environmental awareness and integrity; and (v) awareness of inter-linkages across both space and time.

Ultimately, to achieve sustainable urban development implies addressing and satisfying the economic, environmental, social and political concerns of urban residents (Fig. 3.1); Richardson (1992) defines sustainable urban development as "the development of a city's physical structure and systems and its economic base in such a way as to enable it to provide satisfactory human environment with minimal demands on resources and minimal adverse effects on the environment".

Fig.3.1: The components of sustainable urban development

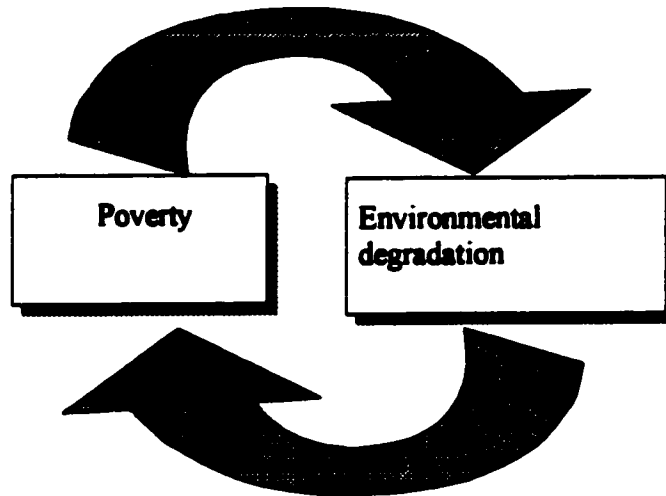


Source: Drakakis-Smith, (1995), p.665

Issues of poverty, employment and other economic activities constitute a critical component of sustainable urban development. There is a widely-held notion that "many environmental problems in developing countries originate from a lack of development, that is from the struggle to overcome extreme conditions of poverty" (Bartelmus, 1986). Thus, "environmental quality and economic development are interdependent and in the long term mutually reinforcing" (Tolba, 1984). In the urban context, poverty is, of course, of fundamental importance since it underpins the ability of the urban household to achieve its own form of sustainable development and in turn impinges on the sustainability of the urban situation as a whole (Schwarz, 1993). As Peil (1994) has observed, poor people "get on with their lives and leave the environment to look after itself". It must be stressed that

survey after survey of squatter settlements have revealed that its not that the urban poor do not care and are not unaware of environmental problems or they do not wish to improve their situation it is simply that they have other priorities (Drakakis-Smith, 1995).

Fig. 3.2 :The mainstream perception of the link between poverty and environmental degradation



Source: Lele, (1991), p. 61

The role of the informal or petty sector is clearly important in this context, since it is the major employer in Africa's urban areas, employing 50 per cent, 73 per cent, 95 per cent and 44 per cent of the labor force in Senegal, Lagos Nigeria, Burkina Faso, Benin, and the Ivory Coast respectively (ILO, 1985). What is required of governments in Africa is to guide and promote this sector instead of trying to ban it.

An area of concern is the physical urban environment itself, what has been referred to as the "brown agenda" (World Bank, 1993b). It is important to identify city-wide issues which fall within the domain of the state, such as energy and water provision, and those where the individual

(household) and neighborhoods/communities can be involved, for example waste collection and disposal through recycling. This distinction is important in the sense that it allows for sharing of responsibilities, and addresses the question of who to involve in the process of finding solutions to urban problems. The urban social environment, which basically concerns the provision of basic needs, should be examined. Basic needs center on a wide range of concerns from shelter and food to education and health care. Major actors in this arena include the state, the private sector, and community /neighborhood organizations. In most African cities, the whole area of basic needs has become one in which self-help and communal instincts and abilities have been explored and tapped to provide some of these basic needs through a series of self-help programs. One should note that there are opportunities for sustainable urban development through partnerships and co-operation between the individual (household), the community and the state in meeting the basic needs of urban residents.

Politics is crucial to urban sustainability, for it can bring about a planning process which is inclusive and participatory, one which could incorporate the poorer elements of society. The political arena is also the point at which urban sustainability as a concept overlaps with urban management as a practical process(Drakakis-Smith, 1995). It must also be stressed that it is within the realm of urban and national politics that sustainability of urban development is determined.

The above concerns regarding employment, poverty, environment and meeting basic needs must be set against the backdrop of a city's demographic situation. The nature and growth of a city's population needs to be carefully examined and incorporated into a city's development program. Achieving urban sustainability is extremely important, given that urban areas are engines of growth. As *Time* magazine has observed, "with urban areas producing about half the world's income and

governments nervous about restive urban populations, agencies such as the World Bank have begun to focus more on cities" (*Time*, 11 January, 1993: 134).

3.5 Healthy Cities

The "Healthy City" concept, developed in the 80s by the World Health Organization, recognizes that the health of city residents depends on all aspects of the urban ecosystem including the social, economic, and physical environments (WHO, 1995). Adopting and implementing the "Healthy City" approach is a means of improving urban health and the urban environment, particularly for poor urban residents. The concept is a public health approach that builds upon the work of Professor McKeown, who suggested that improvement in health does not necessarily depend on advances in medical care and technology, but rather on certain social, environmental and economic changes: (i) family size, (ii) increase in food supplies, (iii) a healthier physical environment, and (iv) specific preventive and therapeutic measures(WHO, 1995).

The concept provides a framework for new partnerships and intersectoral condonation in city management. It recognizes that the city embodies resources, talented people, energy and ideas which can be co-ordinated into effective actions to improve health, and which can turn problems into opportunities to enhance health, productivity and sustainable urban development (WHO, 1991, 1992a, 1992b). Within the framework. the attributes of a healthy city include a clean, safe physical environment that is of high quality; an ecosystem that is stable now and sustainable in the long-term; and a high degree of participation and control by the public over decisions affecting their lives, health and well-being.

3.6 The concept of Urban Management

By the end of the 1970s it had become abundantly clear that urban planners had failed to devise appropriate and adequate strategies to confront the process of urbanization and problems confronting urban areas in developing countries. In virtually all countries in the developing world, it was evident that an increasing proportion of the total population was living in cities (Stren, 1993) and, as the World Bank (1991) suggests, "the developing countries have been transformed from a world of villages to a world of cities and towns". Along with the growth in relative size of urban populations in developing countries was the realization that cities play an important and positive role in the economic development of these countries. Prior to the 70s, urban development had been de-emphasized and attention paid to the issue of poverty, a problem that was considered rural rather than urban in nature, which accounted for the emphasis on rural development. It was argued that improving conditions in cities would accelerate migration from rural, areas to urban areas thus leading to a further deterioration of the rural economy and increased rural misery (Stren, 1993). In addition, the misconception about the role of cities in development was explained by Michael Lipton's (1977) "urban bias" hypothesis, which emphasized that "investment in urban areas was counterproductive since it would simply reinforce the well established urban bias to the detriment of rural areas where real returns on capital were significantly high also contributed to the neglect of urban areas in developing countries in terms of investment".

By the mid 1980s it became evident that rural based policies to improve rural areas and the economies of developing countries had failed. Added to this was the recognition that cities would continue to grow and constitute the engines of economic growth (Harris, 1992). Nairobi, which had less than 5 per cent of the population of Kenya in 1989, had 26.9 per cent of all formal employment

in the country (Government of Kenya, 1990). Harare, with approximately 8.6 per cent of the nation's population, accounted for 36.6 per cent of the total recorded income and 26.6 per cent of the formal sector employment in the country in 1984 (Government of Zimbabwe, 1989). During the 1970s it became evident that World Bank sponsored projects in African countries had failed because of inadequate local maintenance and finances once the bank withdrew (Stren, 1993). In the Bank's important document, *Learning by Doing*, which covered its experience in the urban field from 1972-1982, it was concluded that attention to "efficient urban management" should be the priority (Cohen 1983). In conclusion, the worldwide shift in population from rural to urban areas, the failure of previous urban planning approaches to address urban problems (poverty, inadequate urban services, illegal settlements and environmental degradation), the economic importance of cities and specific project level problems encountered by lending agencies called for an entirely new approach to urban development in developing countries. Now there is a growing emphasis on urban management as opposed to urban planning.

3.6.1 Definition of the Concept of Urban Management

There is no common definition of urban management. A wide range of interpretations exists which focus, for example, on the effective management of urban projects (Clarke, 1991a; Stren, 1992, 1993; Devas and Rakodi, 1993; UMP, 1994), on the integration of micro and macro- level activities, on public service management or on the management of growth, tackling the demands of cities and towns which are expanding and rebuilding with policies for land use, structures and service networks (See for example Clarke, 1992; Stren, 1993; Lindfield, 1993; Nientied, 1993). Stren notes that the concept of urban management is deficient in content and definition and that the central core of the

meaning attached to it is elusive and characterized the concept as "unanalyzed abstraction". He explains that the elusiveness and lack of a clear definition is due to three factors: (i) the tremendous increase in demand on both the donor and recipient sides for urban related assistance created the need for an all-purpose concept that could move the agencies away from the more purely physical, shelter-related projects of the 1970s towards the more institutional approach of the 1980s and 1990s; (ii) the notion of management, as opposed to the older notion of administration, signaled a clear shift from the public sector, statist perspective on development to a more voluntarist, neo-liberal perspective; (iii) this loose concept was adopted by the World Bank to enable it to receive support from a wide range of institutions.

Since the Urban Management Programme was initiated in 1986, it has obtained support and participation from multilateral and bilateral donors and its list of programs has increased. Had the program confined itself to a clear and specific definition from the outset, it would have compromised its organizational flexibility (Stren, 1993). Post (1997) notes that the concept helps draw attention to the urgency of problems of fast growing cities, and, as a broad concept, functions to cover the expansion in demand for urban assistance from international agencies and to attract more funding for the Urban Management Program, the World Bank, UNDP and UNCHS to strengthen the contribution that cities make towards economic growth and social development. In addition, the concept evokes a businesslike approach to urban development while at the same time fitting well into mainstream neo-liberal thinking.

In his article *Old wine in new bottles? An overview of Africa's urban problems and the "urban management" approach to dealing with them*, Richard Stren (1991) gives four important elements of urban management: (i) the need to situate urban development projects in the context of

city-wide and institutional considerations; (ii) a concern to pay more attention to sources of local finance for a more decentralized municipal government; (iii) the need to examine alternative means of organizing and financing urban services and waste disposal, water supply, public transport, electricity and sanitary services; and (iv) the need to seek and promote local community and participatory sources of support for urban services and infrastructure.

Davidson and Nientied describe the "essence of urban management as taking an active role in developing and managing and coordinating resources to achieve a town's development objectives". Devas and Rakodi (1993) define urban management as "covering the full range of governmental interventions in the development and day-to-day operations of the city". Mattingly (1994) examined the concept and notes that it embodies three dimensions: (i) object, (ii) objectives and (iii) actions. According to him, it is not space alone which is critical when it comes to managing cities and towns but what goes on in the space of cities and towns. Seen in this light, the object managed is the collection of activities which take place in the urban area. Mattingly stated that effectiveness, efficiency, transparency and accountability are process objectives which take on meaning when linked to goals (for example, of improving standards of living, ensuring equitable access and fair distribution of resources and achieving environmental sustainability). Actions must be reoriented to objectives since the latter dictate what sorts of actions have to be pursued. Mattingly identified two kinds of action; the first is the "tasks", which affect activities going on in cities and towns and subsequently affect the conditions of goods and services which these activities produce; the second is the process of management.

3.6.2 Attributes of the urban management concept

Post (1997) pointed to four attributes of the Urban Management concept and these are examined in this section. A critical feature of this concept is the recognition of the importance of institutions, rules, working methods and attitudes in urban development. The successful implementation of policies to address urban problems hinges on the fact that urban administrators and government employees have faith in these policies, are committed to implementing them and are organizationally and materially equipped to work accordingly.

Urban Management emphasizes a holistic approach to managing urban areas and hence seeks to combine town planning, economic development planning and municipal management. It breaks with the existing segregation within urban policy and the uncoordinated efforts of different governmental departments, as well as the institutional separation of planning, decision making and action (Post, 1997).

The concept emphasizes a process approach to urban development and hence focuses on the continuous connection between the different steps in the planning process: analysis, policy formulation, implementation, monitoring and evaluation. Emphasis on the process approach stems from the sudden changes in the economic and political environment. Within such a context any approach to managing urban areas must be process-driven and flexible enough to be able to respond and adapt to these changes.

Though Urban Management emphasizes a broad approach to urban development, it avoids the "conventional" comprehensive plan option, and instead relies on strategic planning, which strives to provide a general, city-wide frame of reference which gives guidance to concrete action.

3.6.3 Building blocks of the urban management approach

A review of the literature on urban management reveals that for this concept to be successful, and subsequently bring about improvements in the working and living conditions of (poor) urban residents, certain conditions have to be fulfilled. These are examined below.

Politics

An increased awareness and recognition of the important role of politics in urban development is critical, because it is within the political context that plans are made and implemented. There is a need to identify different kinds of vested interests in order to ascertain how they influence decision making and how to include marginalized segments of the society in the planning and decision-making process. It must also be stressed that the success of any planning endeavor is to a large extent dependent on the commitment of those who are in power as well as the disposition of government officials (Batley, 1993; Devas, 1993; Morah, 1996), for any planning decision is a political decision.

Popular participation

The Urban Management approach advocates what Friedman(1992) has termed a condition of inclusive democracy which calls for the adoption of popular participation. To come up with appropriate policies and plans requires that potential beneficiaries and losers should have the opportunity to play an active role in the process of initiating, designing and implementing urban development policies and plans. One should also note that a feeling of mutual trust should exist

between the government and its citizens, and that the citizens should be well- informed (Rakodi, 1993; Schubeler, 1996; UNCHS, 1996) which can only be achieved through popular participation.

Strong local government

A strong local government which ensures and provides more direct contact between the people and the government and thereby brings about greater awareness of the needs of residents, is extremely important. The approach aims at decentralization, i.e. giving local government more discretionary powers to prioritize, plan and implement projects, and more control over physical matters and local revenues (Cohen and Cheema, 1992; Batley, 1993; Davey, 1993; Brugmann, 1994; UNCHS, 1996).

Economic significance of cities in national development

The Urban Management approach recognizes the economic significance of cities in national development and hence emphasizes the need to improve urban productivity by removing constraints (infrastructural deficiencies, inappropriate regulations, the weakness of local government, the inadequacy of financial services). The central government's macro-economic policies (monetary pricing, fiscal, social services and subsidies) should be aimed at improving urban productivity, notably by stimulating the informal sector (World Bank, 1991; Harris, 1992; UNCHS, 1993; 1996).

Role of the market

The Urban Management approach advocates a greater role for the private sector in the provision of basic services in urban areas. This emphasis on the private sector is the result of the

failure of the state to provide for the needs of the majority of urban residents; hence the adoption of policies on privatization, contracting out and deregulation. However, the state is required to provide a clear framework for urban development and to intervene in areas where the market has failed or areas where the private sector will not intervene on its own accord (World Bank, 1991; Devas and Rakodi, 1993; Cointreau-Levine, 1994; World Bank, 1995a).

Sound management

The urban Management approach envisages sound urban management practices. The management process should ensure: (i) increased efficiency, i.e. more output with fewer resources; (ii) greater transparency, i.e. a clear demarcation of tasks and responsibilities; and (iii) accountability, i.e. decision makers should be required to account for their action or lack of action through some sort of electoral control (Hilderbrand and McAuslan, 1992; UNCHS, 1993; Devas, 1993; Devas and Rakodi, 1993).

From the discussion so far on sustainable development and urban management two important themes emerge which are critical to this research. These are the concept of participation and the integrated approach.

Public participation

The concept of public participation in the design of community plans and projects is central to contemporary planning ideology. Participation in development is considered by many not only as a basic human right but also as the most effective way to ensure the success of development efforts (Korten and Alfonso, 1983). Arnstein's (1971) "ladder of citizen participation" describes different

levels of participation from "manipulation" to "citizen power". Moving up the ladder requires that people are empowered to take an active and informed role in decision making.

Public participation increases public access to decision makers and at the same time enabling the public to provide input into decisions by participating in the decision-making process. Public participation contributes significantly to the "democratization" of the political process (Carroll, 1971; Burch, 1976; Andrews, 1980). Effective public involvement can enhance the understanding of issues and promote greater communication among all participants. Equally important is the fact that citizens become more knowledgeable about environmental, economic and social costs and the benefits of proposed actions. Suggestions from the public can help technical experts understand local attitudes and values and can assist decision makers in identifying sensitive issues and concerns of the community (Lucas, 1976; Langton, 1978). Direct involvement by citizens in decisions which affect them tends to enhance the acceptance and legitimacy of those decisions.

Mitchell (1989) notes that there are three components of a good public participation program. The first component, which he characterized as the "information-out phase", involves the distribution of information to those whose views are sought. The second component, "the information-in phase", involves receiving information from the general public and interest groups. The third phase, "continuous exchange," involves the ongoing dialogue between the affected public and decision makers.

In African cities where the public and private sectors have failed to respond satisfactorily in providing a basic infrastructure to the majority of residents, especially the poor, community mutual-help is a fundamental component of community participation, and is seen as a strategy to provide some of these basic needs. Choguil (1996) suggests a new of public participation levels for developing

countries. This is built on the premise that public participation is not just a means to enable people to influence decisions in the political arena about issues that affect them, but is also a means to obtain, through mutual help, the basic needs which would not, otherwise, be available to them (Choguill, 1996).

3.7 Integrated Approach

Failures resulting from narrowly-conceived incremental and disjointed approaches to environmental and urban management, which failed to deal with interconnections, complexities, multiple perspectives, multiple uses and the resulting cross-cutting externalities (Mitchell, 1986; Bartlett, 1990; Cairns and Crawford, 1991), are widely known. These have led to a clamor for more effective approaches to managing resources, environmental systems, urban areas and so on. Concepts like the integrated approach, integrated resource management and ecosystem management have evolved.

In chapter 10 of Agenda 21, dealing with integrated resource management, some elements of the integrated approach are presented (United Nations, 1993). An effective integrated approach to resource management must include the following elements:

- the strengthening of institutional arrangements and the coordinating of mechanisms for natural resources;
- the facilitation of mechanisms for the active involvement and participation of all concerned, particularly communities and people at the local level, in the decision making process;
- the development of integrated goal-setting and policy formulation at the national, regional and local levels that take into account environmental, social, demographic and economic issues;
- reviews of the regulatory framework, including laws, regulations, decrees and enforcement procedures, in order to identify improvements needed to support the integrated approach;

- the adoption of planning and management systems that facilitate the integration of environmental components such as air, water, land, and other natural resources, using approaches that focus, for example on an ecosystem or a watershed;
- the encouragement of the principle of delegating policy making to the lowest level public authority consistent with effective action and locally-driven approaches;
- the adoption of improved systems for the interpretation and integrated analysis of data on resources and their uses;
- the application of systematic techniques and procedures for assessing the environmental, social and economic impacts of specific actions or resources; and
- the enhancement of education and training through an emphasis on the interdisciplinary and integrative approach in the curricula of schools and technical, vocational and university training, as well as the training of people in relevant sectors (United Nations, 1993).

Mitchell (1994) identifies five components of an integrated approach: legitimation or credibility, functions, structures, processes and mechanisms, and organizational cultures and attitudes.

The context of the issue or system being analyzed is very important; this context may be rural, urban, historical, social, cultural, economic, institutional and political (Mitchell and Hollick, 1993).

Examining the context of an issue or system helps in identifying the opportunities and constraints that exist, which ultimately helps in devising or formulating strategies or solutions to the problem.

Mitchell notes that by analyzing the context of the problem, one can justify the need for integration.

Legitimacy is a prerequisite for the effective implementation of any policy. For an integrated approach to be implemented effectively, it must be regarded as legitimate and credible by elected officials, relevant agencies, and the community.

Management functions must be performed to implement any policy or program, and decisions must be made regarding the distribution of functions among agencies, organizations, and individuals.

Mitchell (1990a) categorized management functions into generic and substantive. The former involves data collection, planning, regulation, development, monitoring and enforcement; the latter specifies what is to be done.

The institutional and organizational structures must be designed to facilitate the efficient performance of identified functions. Mitchell identifies three important points which have to be considered in designing organizational structures: (i) the emergence of boundary problems resulting from shared or fragmented responsibilities (ii) context, and (iii) flexibility.

Mechanisms and processes under which the system will operate must be introduced, particularly regarding boundary and edge problems. The culture and attitudes of the organizations and people involved must be considered, as these influence the effectiveness with which any policy is implemented. It is therefore critical to identify the features of the organizational culture and the attitudes of participants with regard to their willingness and support for integration.

3.8 Planning Conceptual Frameworks

At this point it is important to examine major planning conceptual frameworks and identify those which are critical to this research. As already shown in this chapter, the concept of participation and integration are fundamental to strategies designed to address urban problems in African cities. Seen in this light, integrating organic solid waste management with urban agriculture will ultimately draw on the concepts of participation and integration, since there are various actors and stakeholders who need to be involved and various institutions which have to be integrated and coordinated effectively to design and implement the waste reuse urban agriculture strategy. Emphasis, then, is placed on the transactive planning framework..

Lawrence (1981) suggested that the term "conceptual framework" is a more accurate description of planning theory. Corbett (1986) in a review of planning, defined the term conceptual framework as a "set of concepts and principles for the exploration of possible relationships and outcomes". It must be emphasized that no one planning conceptual framework stands alone. Hudson (1979) stated that "each can render a reasonable solo performance in good hands, but fuller possibilities can be created by the use of each theory in conjunction with others". Christensen (1985) advocated a mode through which different types of planning are applied to varying circumstances, and Krieger (1974) suggested that planning "needs to be grounded in the actual situation", and should be context-specific. Faludi (1973) and others like Galloway and Mahayni (1977) noted that there are two types of planning theory. Theory "of" planning addresses the process of planning, including its ideology, values, purposes and principles; and theory "in" planning relates to the substantive issues (the what of planning and for whom) addressed by the planning process (for example, issues related to social, environmental and physical planning).

3.8.1 Transactive planning.

Transactive planning draws affected populations into the planning process, is participatory, and makes use of "expert and experiential knowledge" through the process of "mutual learning" and a "face to face transaction" between the planners" (Alexander, 1994). Transactive planning is based on the merging of expert or processed scientific knowledge and ordinary peoples' knowledge through a process of mutual learning (Weaver et al., 1985; Friedmann 1973). The merging takes place through dialogue in groups.

In mutual learning, the planner and the client each learn from the other - the planner from the client's personal knowledge, the client from the planner's technical expertise. In this process, the knowledge of both undergoes a major change. A common image of the situation evolves through dialogue; a new understanding of the possibilities for change is discovered. And in accord with this new knowledge, the client will be predisposed to act (Friedmann, 1973).

Transactive planning identifies policy issues by focusing on the everyday experiences of people's lives (Hudson, 1979). The planner is a subjective participant whose role is integrative and educational (Lawrence, 1981). Transactive planning occurs within a "hierarchical structure of social guidance" the process of mutual learning brings the top and bottom of the hierarchy, and the expert and the client, closer together (Weaver et al., 1985). Friedmann suggested that dialogue in small groups of ten to twelve people formed the basis of a good society. Theoretically, in a good society, "a dialogue of all with all" is possible. Defined by Friedmann as "dyadic communalism", this relational view of people is able to "accept the claims of both society and individual(s)."

The transactive planning framework is based on social learning theory. Weaver et al., (1985) suggested that planners turned to social learning as a reaction to logical positivism and to the failure of rational planning. Friedmann (1973) defined social learning as :

The processes by which society gathers and internalizes knowledge about the changing conditions of both its internal and external environment.

Friedmann (1987) has described social learning as being based on the assumption that all effective learning comes from the experience of changing reality. Social learning begins and ends with action or purposeful activity; learning and practice are interdependent processes (Friedmann, 1987). He suggested the following conceptual scheme of social learning:

- collaborators act through small, task-oriented groups; the groups are temporary social systems that are continuously forming and reforming;
- social learning is a cumulative process that lasts for the duration of a given cycle;
- social learning in small groups takes place primarily through face-to-face relations, or dialogue;
- objectives emerge in the course of ongoing action (Friedmann, 1987).

The strengths of transactive planning include the process of dialogue and bargaining among plural interests as well as developing relationships based on trust in an open, iterative, and exploratory process that supports the development of new ideas and is flexible in the face of uncertainty (Weaver et al., 1985; Lawrence, 1981; Hudson, 1979). The success of transactive planning is based on its impact on the people involved in the process (Hudson, 1979).

Key weaknesses of transactive planning and social learning are that the issues of power are not addressed effectively, and there is little guidance for extending the theory into practice (Lawrence, 1981; Hudson, 1979). Friedmann discussed two problems associated with social learning: rationalistic bias and the validation of knowledge. There are three factors to consider in relation to rationalistic bias: people are not eager to acknowledge error, people come to treasure certain practices and ideas, and it is essential to believe in what you are doing (Friedmann, 1987).

3.9 Conclusion

The concepts of urban management, sustainable urban development, and integrated and participatory approaches, constitute the theoretical foundation of this study. Integrated, participatory and transactive planning paradigms constitute the basis for designing and implementing the waste reuse urban agriculture objective which, in combination with other urban management strategies

designed to address urban problems when effectively implemented, will ultimately lead to our goal of sustainable cities. The major components of the transactive model are dialogue and mutual learning and to achieve these through participation, this study adopted qualitative research techniques- conversations, informal discussions, and demonstration projects.

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Chapter 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter examines the approach used to investigate the research objectives and discusses the methods of research design, field research, analysis and presentation of data. It must be stressed that the participatory approach which underlies most of the theoretical frameworks discussed in chapter 3 of this thesis influenced the research approach with a resulting emphasis on qualitative methods of data collection.

4.2 Research Framework

The qualitative approach is appropriate to this study because of the fact that the study is exploratory in nature and deals with an entirely new area, hence not much has been done in terms of research and publication. Methods and procedures are essentially descriptive and include formal and informal interviews, conversations, discussions, participant observation and demonstration projects. In any qualitative research, emphasis is placed on examining issues from a variety of perspectives, and it seeks to discover and understand what people's lives, experiences, and interactions mean to them in their own terms and in their own settings (Patton, 1980; Bogdan and Taylor, 1975). Emphasis is placed on depth and detail. Detailed descriptions, quotations and documentation constitute the basis of analysis (Patton, 1980). Lakin described qualitative researchers as people who believe

...that human reality lies within our subjective experience, and that we often learn more from examining the variability among individuals and groups than we do from computing an average or estimating a total

Lord, Shnarr, and Hutchison (1987) identified four characteristics of qualitative research. First, they noted that methods of qualitative research are naturalistic in that the research setting is not manipulated. Ultimately, the validity of the research is strengthened since the research informants are generally more at ease in their own settings (Patton, 1980). In addition the researcher is able to account for the social context in which the research occurs (Ackroyd and Hughes, 1981). Second, qualitative research is holistic, for the researcher attempts to understand the "unifying nature of particular settings, events, perceptions, and interactions". Third, qualitative research "acknowledges the subjectivity of human behavior". The data allow the diversity of people's lives, experiences, and perceptions to be captured. Finally, qualitative research is a scientific process in which the role of the researcher is to "know, accept, and present" the perspective of the research informants (Bogdan and Taylor, 1975).

4.3 Sources and Nature of Data

Primary and secondary data constitute the sources of this research. Primary data include responses to the interviews, discussions, conversations, field observations and a demonstration project. Published studies, reports and texts and unpublished reports are part of the secondary data.

The field work was executed in three phases. Phase one began in July, 1995, when the author was on a visit to Accra. During this time the author identified key actors whose role is critical to this study. These individuals range across urban management institutions, solid waste generators, urban cultivators, users and potential users of recycled organic solid, waste, traditional political institutions and research establishments.

Key informants from institutions named above were identified and contacts made. Furthermore, the author had discussions with a number of high- ranking city officials: The Mayor, the Metropolitan Director of Food and Agriculture, the Director of Public Relations of the ruling National Democratic Congress Party, the Head of the Waste Management Department and the Deputy Director of the Environmental Protection Agency. There was a general consensus from these officials that this research was timely and some of them suggested issues to be investigated. The author took the opportunity to identify communities to initiate the community composting pilot project.

Back in Canada with this background information, the author embarked on an extensive literature review to identify issues, themes and lapses in research. Upon completion of the literature review, the proposals were developed, and after a critical review by my PhD advisory committee, the necessary corrections were made and, upon acceptance, IDRC funding was sought and obtained. Finally, the questionnaire for the field research was developed. The second phase of the field research began in November 1997 and concluded in April 1998. The third and final phase commenced in June and ended in September of 1998.

The field research consisted of two interrelated parts: (i) a socio-economic survey and (ii) a community-based demonstration project. The socio-economic survey was addressed to the following audiences: (i) urban cultivators; (ii) urban management institutions (government and community/neighborhood institutions) (iii) major waste generators; (iv) users and potential users of recycled organic solid waste; and (v) NGOs, both local and foreign.

Two sets of semi-structured interview guides were developed. One set was primarily for urban cultivators, and the second one was designed for the rest of the key informants named above. The interview guides consisted of a set of structured, open-ended and closed-ended questions. The open-ended questions produced largely qualitative data that were extremely helpful because of the exploratory nature of this research. Closed-ended questions yielded quantitative data. For the purpose of this study, urban cultivation in Accra was categorized into three farming systems on the basis of location and used as units of investigation. These were: (i) household or home gardening; (ii) open / vacant space cultivation; and (iii) peri-urban cultivation. Household or home gardening takes place within and around houses. Vacant space cultivation takes place in open spaces, community lands, undeveloped residential land, parks, stream banks, roadsides, reservations along drainage channels, wetlands, abandoned waste dumps, right- of- ways and airport buffers. Peri-urban cultivation takes place in areas just outside the built area of the city. On the basis of the above categorization 87 urban cultivators, 31 from household and 28 each from vacant and peri-urban systems, were interviewed. One may ask why 87 farmers were interviewed. It must be emphasized that the actual number of farmers in the metropolis is not known. Numbers given in official documents and reports are mere estimates, which made it difficult to select any

specific sample size. Furthermore, since the interviewing process was voluntary, the author interviewed willing informants and, working under time constraints, managed to interview 87 respondents.

To supplement the interview efforts, the author visited ten sites in the metropolis which are major locations for urban farming activities (See Fig 1.3), and observed, conversed with, and conducted focus- group interviews with some of these farmers. These discussions provided the opportunity for participants to share their feelings, insights and experiences about their problems and needs, as well as to demonstrate their willingness to engage in organic solid waste recycling and to use compost as a soil conditioner on their farms. The type of data sought from the interviews included the socio-economic and demographic characteristics of cultivators, farming practices touching specifically on the type of crops grown, the acreage of land being cultivated, the kinds of fertilizers used, awareness of the use of and willingness to use organic wastes as soil conditioner, land ownership, motives for cultivation, the perceptions and concerns, if any, about the reuse of organic wastes in urban cultivation, and problems they face as farmers in the metropolis.

The other interview guide was addressed to institutions (Table 4.1). Information sought from these institutions focused on what they perceive to be the major environmental problems facing the city, their perceptions about farming in the city, their preparedness to consume food cultivated with organic wastes, problems they think are associated with reusing organic wastes on a large scale in urban cultivation, and their willingness to promote the concept of waste-based urban cultivation. Urban management institutions, major generators of organic solid waste, aid agencies, political institutions and users and potential users of

compost were sampled and interviewed. Preceding the interviews the author had informal discussions with most of the officials who had been selected to be interviewed (See table 4.1). These discussions were designed to discuss some of the themes raised in the questionnaire and to establish the necessary rapport, trust and friendliness between the researcher and these officials, which are critical to the success of any data collection exercise in African countries.

Face -to- face interviewing was selected over other interviewing techniques like telephone and mail. Due to the lack of telephones in their homes and the Ghanaian preference for face- to- face interaction, use of mail and telephone techniques were deemed inappropriate.

Table 4.1: Institutions surveyed during the field work

Institutions	Interviewee
Urban Management Public Waste Management Department Accra Metropolitan Authority Town and Country Planning Department Ministry of Local Government Environmental Protection Agency Ministry of Environment Department of Parks and Gardens Accra Sustainable Project Community/ Neighborhood Nima 441 La Mansokpee Kungiyar Nasara	Chief Mechanical Engineer Heads of planning, health, works and education units. Metropolitan Director of Planning, Deputy Director of Planning for the Greater Accra Region. Secretary Deputy Director, and Head of the Waste Management Unit. Director Director Head Leaders
Major generators of organic solid waste Indigenous markets Aglogloshie Kantamanto Malata Kaneshie Hotels Golden Tulip Secaps Novotel Labadi Pleasure Beach	Market Queens Managers
Political Sub-Metropolitan Councils Okaikoi, Ashiedu-Keteke, Osu Klotey, Ablekuma, Kpeshie and Ayawaso. Traditional Ga Traditional Area.	Council Heads Ga Mantse
International Aid Agencies F.A.O UNDP CIDA USAID	Resident Representatives
Users of compost Metropolitan Department of Food & Agriculture Farmers Ministry of Agriculture	Director Leaders of Farmers' Associations Regional Director

Source: Author, 1998

The involvement of the institutions listed in table 4.1 underscores the holistic and participatory orientation of this research. Furthermore, the involvement of these institutions centers on the important role they could play in the implementation of the concept of waste reuse urban cultivation.

4.4 The Community- Composting Pilot Project

The pilot project was initiated to explore, demonstrate, and test the feasibility of waste-based urban cultivation as a solid waste management strategy, to serve as a link between urban food cultivation and municipal solid waste management, and to serve as an educational tool.

4.4.1 Project site

Christian village, a poor and high density community with a population of about 2,500 and located between Parakou and East Legon high-class residential areas, was selected as the composting pilot project site (Fig. 1.3). It is a migrant community which was settled by Ewes from the Volta region of Ghana, Togoland and Benin. A significant proportion of its residents are unemployed or underemployed, and those employed are basically in the informal sector as petty traders, "chop bar" operators, mechanics, farmers and stone crackers. Most of these activities are operated from homes.

Access to sanitation and waste disposal facilities is very limited since the facilities are inadequate. There are only two public toilets for a community of 2,500 inhabitants and, in

terms of solid waste collection, the community is not covered by the city's waste management collection services. The community's waste management strategies mainly consist of open dumping and burning; there are six open dumps in the community. The community boasts active and dynamic youths, women and development groups who keep the village clean by organizing clean ups, weeding and desilting drainage channels, and who through self-help have constructed two public toilets and extended electrical power to the community.

This community was selected because it is not covered by the city's waste collection services and it is a community with immense waste collection and disposal problems. Furthermore, it is stable (i.e. its residents are not threatened with eviction), it has a significant number of its residents engaged in urban cultivation and it has well-organized, active and dynamic community groups dedicated to improving the community's environment. To get the project off the ground the following procedures and methods were employed.

4.4.2 Consultations

Between January 16 and February 2, 1998, the author organized meetings and discussions with the chief and elders of the community, representatives of youth and women's groups, farmers, a representative from the Waste Management Department, and three agricultural extension workers from the Metropolitan Department of Food and Agriculture to discuss and explain the objectives of the project. The next phase of the consultation process involved communicating and explaining the project to residents of the community. The chief, in conjunction with community groups, asked for volunteers to visit various homes to explain the project and identify households which were willing to participate in the project.

Eight volunteers went from house to house to explain the purpose of the project. Women, because of their role as household managers, were targeted. Within this period Twenty households out of the community's three hundred households volunteered to participate in the project.

4.4.3 Source segregation

The author and the eight volunteers visited the participating households and demonstrated how to source separate their wastes into compostables (food and kitchen waste, animal droppings and dirt) and non-compostables (thin and broken plastics, metal cans, and hazardous household waste like batteries, blades, broken glass and wood). These households, who were located in ten houses, were each given a plastic pail in which to store the compostable fraction of the household waste stream. Two big plastic drums were also placed in the community's market in the care of the "market queen", who volunteered to organize members to place the compostable waste generated in the market into the drums. Every morning, using four wheelbarrows, volunteers picked up the source- separated waste from participating households and took it to the site earmarked for composting the waste. Source separation, as demonstrated in chapter 2, section 2.8.5, is central to any composting project. It is designed to avoid the health risks associated with composting contaminated waste and to produce high quality compost.

4.4.4 Site selection and building of the compost heap

The volunteers who managed the project, in consultation with the chief and the participating households, selected a site the size of a football field near one of the community's waste dumps as a composting site. From March 5 to April 1, 1998, two and half tons of compostable household and market waste were generated from participating households and from the community's market. The compostable fraction served as feedstock for the compost heap. Using a simple windrow aerobic composting technique the heap was manually formed, sprayed with cow dung solution, and turned periodically for aeration and fermentation using manual labor. It measured 4x3x10 feet. The heap was insulated with a layer of soil and turned every week. Within nine weeks the heap had decomposed into compost (Photos 1,2,3,4).



Photo 1: Pigs feeding on compost feedstock



Photo 2: Building the compost heap



Photo 3: Watering the compost heap

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Photo 4: Turning the compost pile

4.4.5 Data Presentation

Qualitative and quantitative methods were used to analyze the data and information obtained from the field. The analysis of transcripts of interviews and field notes was done by identifying common themes which helped to categorize findings of the study in the light of research objectives. Finally, implications and conclusions were drawn. Quantitative data gathered mainly from closed-ended questions were categorized and analyzed to produce frequency counts and percentages. See (table 4.2) for framework for data analysis and presentation.

Table 4.2: Framework for data analysis and presentation

KEY RESEARCH QUESTIONS	DATA SOURCES	DATA COLLECTION TECHNIQUES	MODE OF DATA ANALYSIS
1. What is the geographic, demographic and socio-economic distribution of urban farmers in Accra?	-Metro Agric Dept., -Farmers, -Published and unpublished materials	-Formal /informal interviews, -Discussions, -Observations,	Quantitative Qualitative
2. Where in the city is urban food cultivation done? What types of crops are grown, how much urban land is under cultivation and what is the number of residents engaged in farming?	-Maps, -Farmers associations,		
3. What are the nature and characteristics of Accra's municipal solid waste? How is organic solid waste from the city's msw stream currently being utilized? Who uses it, in what form and for what purpose?	-W.M.D, -Farmers, -Metro Agric Dept.,	-Formal/Informal - interviews -Published and unpublished reports	Qualitative
4. Do urban farmers use recycled organic solid waste? What are the methods of organic solid waste utilization in urban farming?	-W.M.D, -Farmers, -Metro Agric Dept.,		
5. Are farmers interested in using recycled organic solid waste to fertilize their fields? What are the opportunities and constraints to waste-based urban food cultivation?	-W.M.D, -Farmers, -Metro Agric Dept,		
6. Are there any existing programs and policies for promoting the use of recycled organic waste in urban cultivation, and are policy makers prepared to provide support for the integration of organic solid waste recycling and urban farming?	-A.M.A., -W.M.D., -Metro Agric Dept., -Farmers Association, -Published/ unpublished reports, -Development Plans of Accra	-Formal/informal interviews, -Discussions, -Literature review,	Qualitative
7. Do Municipal Solid Waste Management policies encourage the use of recycled organic solid waste in urban food cultivation?	-A.M.A. -W.M.D. -Metro Agric Dept. -Farmers Association -Published/ unpublished -Development Plans of Accra		

Source: Author, 1998

Chapter 5

RESEARCH FINDINGS AND DISCUSSION

5.1 Introduction

This chapter presents three sets of findings from the study. Section 1 presents the results of the socio-economic survey of farmers; the second, findings from the survey of respondents selected from: (i) urban management institutions, (ii) major waste generators, (iii) users/potential users of recycled organic solid waste, (iv) political institutions, and (v) Aid agencies; finally, the third presents the findings from the community-based composting demonstration project. The central theme of this study is to explore, demonstrate and develop effective and sustained linkages between urban food cultivation and municipal solid waste management through organic solid waste recycling as a waste management and resource conservation strategy in Accra, Ghana and other cities in Sub-Saharan Africa.

The findings are presented with direct reference to the overall research goal, objectives and questions raised in Chapter 1.

5.2 Nature and Status of Urban Food Cultivation.

The study examines issues of who cultivates, as well as farming practices and the extent of cultivation, factors which determine the status of urban cultivation. Knowing the status of urban food cultivation, which in this study indicates the temporary or permanent nature of urban food cultivation, is critical because the assumption is that if organic solid waste is to be recycled into urban food cultivation, then urban farming should be a permanent activity to absorb the increasing quantities of organic solid waste generated in Accra. The

sustainability of waste reuse urban food cultivation, then, is contingent on the permanency of urban food cultivation. Elsewhere in the literature critics point out that urban farming is a temporary activity undertaken by transients and recent migrants to the city, and which will disappear on its own in the course of "sustained development". It is therefore important to know in a study of this kind the nature and status of urban farming. It must be pointed from the outset that most often findings from the three farming groups will be presented in aggregate form but where significant differences exist and on very important and critical issues comparisons will be drawn.

5.2.1 Gender and marital status

Male farmers predominate in urban food cultivation in Accra. Seventy-two out of 87 respondents were men. This finding is consistent with similar findings by Amar-Klemesu and Maxwell (1998) and Cencosad (1994), and contradicts the findings of other studies conducted in other African cities by Tripp (1990) and Mvena et al. (1991) in Tanzania; as well as in Kenya, Uganda, and Zambia (Sanyal, 1984; Rakodi, 1988; Lee-Smith et al., 1987; Freeman, 1991; Maxwell and Zziwa, 1992), which revealed that there are more women than men in urban farming in these countries. Rakodi (1988) argued that urban agriculture in Lusaka, Zambia, is primarily undertaken by women who supply most of the agricultural labour. Sanyal's (1984) study of urban farmers in the squatter settlements of Lusaka concluded that the single most important factor in urban farming was the perception that women ought to cultivate because the women in the household are generally responsible for seeing that food is provided in the home.

Given the above findings in other African cities, the question is, why are men, not women, in the majority in urban farming in Accra? To seek answers to this phenomenon, the author engaged in informal discussions with both female and male farmers and female traders. Reasons offered by male cultivators reflect the traditional role of men and women in Ghana, where women dominate in petty trading activities. As one male farmer remarked, "I cannot compete with the women in selling foodstuffs, fish, meat and the like, even if I can, I will not feel comfortable in their midst, I will be laughed at as being *Kwadwo Besia*" (woman). In addition, in most places in Ghana, women do not farm by themselves but assist their husbands; therefore it is quite uncommon for a woman to farm by herself. The men also explained that farming in the city is very tedious, labor intensive and requires a lot of attention hence very few women prefer to farm. The women traders explained that trading is far more lucrative and stable than farming. Some of them stated that their parents in the rural areas have farmed throughout their lifetime but are still poor. "We do not want to follow their footsteps, we have to rescue them from poverty, and furthermore farming takes place in the village, not in the city".

The women noted that since farming is subject to the vagaries of the weather, market and other factors which cannot be predicted, it is not a very stable source of income generation; hence it makes sense for them to engage in trading or something else so that if their husbands had a bad year in farming the household could rely on the income and proceeds realized from the women's trading activities (Amar-Klemesu and Maxwell, 1998). It is therefore not strange, as observed in this study, that only one trader engaged in urban food cultivation as a part- time activity.

Sixty-nine of the respondents were married, while 16 were single and 2 were divorced. Seventy-eight of the farmers have household sizes ranging from 4 to 13 persons while only 9 farmers have households below 4 persons. Peri-urban cultivators had large households with vacant space cultivators having small household sizes.

5.2.2 Ethnicity

Seventy-one farmers were migrants from the major ethnic groupings of Ghana- Akan, Ewe, Adangbe and Northerners. The Akans are in the majority with regard to household or backyard cultivation. The Adangbes and the Gas predominate in peri-urban cultivation, while the Northerners are in the majority in vacant and open- space cultivation (see table 5.1).

Table 5.1: Ethnic Composition of Farmers

Ethnicity	Farming Systems			
	Household	Vacant/Open	Peri-urban	Total
Akan	21	4	6	31
Ewe	5	6	5	16
Northerner	2	8	0	10
Ga	2	2	7	12
Adangbe	3	3	8	14
Non-Ghanaian	0	4	0	4
Total	33	27	26	87

Source: Survey Data(1998).

Various reasons could be offered to explain this phenomenon. The Akans are known to live and own the majority of houses in the middle and high- class residential sectors of the city: that these are areas with enough space within and around homes for cultivation explains why the Akans are in the majority in household cultivation. Northerners, who are mostly found in high- density residential areas without space to cultivate, tend to cultivate the open and vacant land found in the built area of the city. The Gas' and Adangbes' domination of peri-urban cultivation could be due to the fact they are the original inhabitants of Accra and most of these Gas and Adangbes who were not engaged in fishing were originally rural farmers farming in the villages on the outskirts of the city, and since the city has grown to engulf these villages, these farmers still cultivate for the urban market.

Equally important is the decreasing number of non-Ghanaian migrants involved in urban food cultivation in Accra. Okrah's (1983) study of urban vegetable cultivators in Accra revealed that 90 percent of urban cultivators were non-Ghanaian migrants from the neighbouring countries of Mali and Burkina Faso, but as this study shows, their numbers have shrank considerably. Only 4 farmers were non -Ghanaian migrants. Ghana's economic crisis in the 80s made Ghana an unattractive destination for migrants from the countries in the sub-region; hence their declining number.

5.2.3 Education

Most farmers had some form of education. Only 16 respondents said they had no formal education. However, 39 respondents had completed elementary school, 26 had high school education and 6 had attained post-secondary education (See table 5.2). It is evident

from the table below that differences exist in levels of education of farmers from the three farming systems. Household cultivators are better educated with peri-urban and vacant space cultivators less educated.

Table 5.2: Level of Education of Farmers

Farming Systems				
Education	Household	Vacant/Ope n	Peri-urban	Total
No education	2	9	5	16
Elementary	11	10	18	39
Secondary	14	7	5	26
Post Secondary	6	0	0	6
Total	33	26	28	87

Source: Survey data, (1998).

That there are so many farmers with some form of formal education collapses the myth that urban cultivation is a marginal activity undertaken by the uneducated. The involvement of people with fairly high education is an indication of how bad the Ghanaian economy is in terms of formal employment.

5.2.4 Age of cultivators and length of cultivators

Over 60 per cent (53) of farmers of both sexes were in the 15-45 age group. Twenty-nine farmers fell between 46 and 60 and 5 farmers fell between 61 and 75 years. Forty

cultivators reported to have been cultivating between 3 to 10 years. Sixteen have been in cultivation for between 11 and 20 years and another 16 have been cultivating over 20 years. Fifteen farmers reported having cultivated less than 3 years. To know whether farmers intend to abandon urban cultivation respondents were asked:

Do you intend to quit urban cultivation?

Forty-eight farmers stated "no," and reasons given were that because the job market in the formal sector has deteriorated they do not contemplate quitting, and even if the job market is good they will not quit entirely but will cultivate on a part-time basis. Others stated that food cultivation supplements their income and household food purchases, so they do not intend to quit now or in the near future. 8 farmers contemplated stopping cultivation because of the lack of security and availability of land. Others stated that they were not making any profit from cultivating.

5.2.5 Occupational characteristics of urban cultivators

Thirty-six respondents declared urban cultivation to be their full-time job and their primary source of livelihood, while 51 cultivators listed urban cultivation as their part-time job. All farmers in the household farming category were part timers. The highest concentration of full-time urban cultivators were found in the open/vacant space farming system, with a recorded 21 farmers, followed by the peri-urban farming system, which had 15 farmers. Thirteen peri-urban and 7 vacant space cultivators were part-timers. Also revealed was that urban cultivators came from diverse occupations: police officers, civil servants, teachers, drivers, mechanics, carpenters, masons, security officers and students indicating that urban

cultivation is not confined to a particular class of occupation. Furthermore, significant numbers of civil servants were engaged in food cultivation. As demonstrated in section 1.7.4 of chapter 1, structural adjustment policies being pursued by the government of Ghana which, among other things, involved laying off junior workers of the civil service, has led to a significant number of civil servants without jobs. Consequently, some of these civil servants have taken to part-time or full-time farming in the city.

5.2.6 Land access, ownership and site selection

Fifty-two peri-urban and vacant space cultivators did not own the land on which they cultivated. Only 4 peri-urban cultivators owned the land, and none in the vacant space farming category owned the land on which they farmed. These lands belonged to the central and municipal governments, corporations like Ghana Railways, the Volta River Authority, the Irrigation Department, Parks and Gardens, the Atomic Energy Commission, Civil Aviation, and educational institutions like the University of Ghana. Some farmers did not even know the owners of the land on which they farmed. Four farmers in the household category were owners of the house within and around which farming was undertaken; the remaining 27 household cultivators were renters but paid no fee for cultivating the land. Only 1 farmer in the vacant space category paid money for the use of the land and in the peri-urban farming system 8 farmers were engaged in *abusa* and *abumu* tenancy arrangements ("Share cropping"). The *abusa* system requires the farmer to give up a third of the total farm produce to the owner of the land as payment for the use of the land, while the *abumu* arrangement allows the landowner to receive half of the total farm produce for the use of his/her land.

The study did confirm a significant correlation between farm sizes and farming areas.

Table 5.3: Farm sizes in the three farming systems

	Farming Systems		
Farm sizes in acres	Household	Vacant	Peri-urban
< 1	30	0	0
1-3	1	23	15
4-5	0	5	13
Total	31	28	28

Source: Survey data, (1998)

As indicated in table 5.3 above, household farm sizes appear to be smaller than vacant and peri-urban farming systems. The plot sizes of 30 cultivators in the household farming system were less than one acre. Most vacant (23) and peri-urban (15) space cultivators' farm sizes ranged between one and three acres while 13 peri-urban cultivators and 5 vacant space cultivators farmed 4-5 acres. What emerged is that farm plot sizes in the household farming system are small compared with vacant and peri-urban farming systems; hence household cultivators are not satisfied with the sizes of their plots.

Asked about what factors they consider for choosing a particular piece of land to cultivate, 28 cultivators from both vacant and peri-urban farming systems indicated proximity to residence, 10 indicated proximity to water, another 10 stated rent- free land, and eight indicated fertility and the suitability of the land for cultivation. The nearness of farming plots to the farmers' residence is essential for a host of reasons. These farmers explained that since theft from their farms is a major problem, staying close to their farms offered them the opportunity to keep an eye on them. Most vacant space cultivators have organized into groups

and take turns watching their farms, especially during harvesting periods. On some of these farms, farmers have built sheds in which they stay at night to guard their farms (Photo 5)

In addition, they maintained that it was very expensive to farm far away from one's residence: the transportation cost of getting back and forth is high, and in a city where there are extremely high levels of traffic congestion, one has to spend hours to get to his or her farm, which reduces the hours one has to spend on the farm. Availability of water determines whether the farmer cultivates seasonally or all year round. This explains why vegetable growers who need a lot of water for their operations, whether in peri-urban or vacant space farming systems, are mostly located near streams and drainage channels, or in areas which could be connected to piped water, provided the farmer can bear the cost of extending the piped water to his or her farm and pay for expensive water bills. Cultivating near streams and drainage channels makes it easier for the farmer to obtain much needed water for irrigation; at the same time, however, these farms are prone to floods during the rainy season, which destroys crops and results in substantial losses to the farmer (Photo 6).



Photo 5: Farmer's shed used both as resting place and a place to guard farm



Photo 6: Farmer harvesting from his flooded farm

5.3 Farming Practices

Issues focusing on the types of crops grown, techniques of cultivation, and the application of organic wastes, manure and artificial fertilizers are examined in this section.

5.3.1 Crops cultivated

Thirty-six cultivators in all three farming systems cultivated vegetables; the same number of farmers cultivated food crops. The largest concentration of vegetable cultivators, (25) was found in the vacant space farming category, located near streams and drains. Vegetables grown are mainly exotics such as cauliflower, lettuce, cabbage, carrots, sweet peppers, french beans, beet roots and herbs. Indigenous vegetables grown include okra, peppers, tomatoes, egg plant, and green leafy vegetables like *ademe*, *ayoyo*, *gboma*, *busanga* are grown. These are not grown purposely for sale but rather are staples for the gardeners and cultivated for personal consumption, although any surpluses are sold. Food crops like plantains, cassava, and cocoyams were mostly grown by household and peri-urban cultivators. Twenty cultivators in the household farming system were engaged in food crop cultivation. Fruits like pineapples, mangoes, pawpaws, coconut, palm oil and oranges were grown by household farmers (most of them were used as shade trees) and on a commercial basis by peri-urban cultivators both for the local market and for export.

5.3.2 Cultivation techniques

From observation and conversations with farmers, various implements and tools used in urban cultivation were identified. These tools, which are made locally by recycling artisans, included hoes, cutlasses, rakes, digging forks, hand forks spades and watering cans. A few large scale peri-urban cultivators engaged in some form of mechanized farming through the use of hired tractor ploughs.

Two types of cultivation were identified, determined by the availability of water: seasonal and year round cultivation. Sixty-two cultivators in the three farming systems cultivated throughout the year, while 25 were engaged in seasonal or rain fed cultivation. Most of the farmers who farm throughout the year cultivated mainly vegetables which can be grown even in the absence of rain, provided there is water. However, farmers scheduled production so as to coincide with periods of high demand. Farmers nevertheless cultivate vegetables as many times of the year as they can, depending on the period of maturity of the vegetable crop, the ability to replenish the soil, and above all, the farmer's energy.

Vegetable production involves a series of distinct operations, beginning with clearing and followed by bed preparation. On previously cultivated gardens, beds are raised by remaking old ones. Very hard ground is softened by watering it before the beds are raised. This procedure is followed by the application of artificial fertilizers or organic manure which is spread on or dug into the soil and left for a few a days after which the soil is ready for sowing. Sowing is direct for crops like okra and carrots, while seed is nursed and transplanted for crops like lettuce, onions and cabbage. Crops which are prone to attacks by pests are treated with insecticides.

Watering, forking and weeding are done on a daily basis. The beds are watered every morning and evening, followed by weeding and forking. Weeds are hand picked because the spaces between vegetable plants are too small to allow for the use of implements like hoe and cutlass. The beds are forked to loosen the top-soil to facilitate hand picking of weeds, and also to prevent the formation of a hard cap on the surface.

Early-maturing crops are often intercropped with late-maturing crops on heavily-manured soil. The intercropping of lettuce or raddishes (early- maturing) and cabbage (late-maturing) is very common, as these early maturing crops can be harvested without substantial damage to the late maturing crops.

5.3.3 Extent of artificial fertilizer usage

Fifty-seven cultivators from the three farming categories did not use artificial fertilizers; thirty did use common fertilizers like NPK, Ammonia Sulphate and Urea. The reasons given by those who did not use artificial fertilizers include the expense of artificial fertilizers (30), the negative side effects of using fertilizers over a long period of time (20) and the availability of alternatives (16); the remaining 21 farmers stated that the land on which they farm is fertile. The highest number of farmers who used artificial fertilizers were found in the vacant space farming category, followed by peri-urban farmers. Few farmers (4) in the household farming category used artificial fertilizers. The yearly expenditures for fertilizer purchases are very minimal. Out of the 30 farmers who used artificial fertilizers, 13 spent less than 40,000 cedis, 8 spent between 40,000-100,000 while the remaining (8) spent above 120,000 cedis and above.

5.3.4 Waste reuse urban food cultivation practices

To examine waste-based food cultivation practices in the study area, cultivators' awareness about organic waste reuse, types of organic wastes used, their application and problems encountered in reusing organic wastes in urban cultivation were explored through interviews using questionnaires, observation, conversations and informal discussions with urban cultivators. Exploring the above issues is important in that they help set the stage for designing a meaningful and pragmatic framework for waste reuse urban cultivation.

Eighty cultivators from the three farming systems were aware that organic wastes could be used in food cultivation; only 4 farmers stated they had no idea. Sixty-one farmers applied some form of organic waste. Twenty-six did not use organic waste. Organic waste commonly used included cow manure and chicken droppings. Farmers using organic waste were peri-urban (18) and household (18) farming systems, with the highest number (25) of farmers using organic manure found in the vacant space farming category. Among the 26 farmers who did not use organic waste, 14 explained that the problems of odor and rodents prevented them from doing so. Five stated they did not know how to use it, and the remaining 7 indicated that the land on which they farmed was already fertile and so they did not see the need to apply organic wastes to their farm plots.

Among those using organic wastes, 54 used chicken droppings and cow manure, 6 used household kitchen waste and one used both kitchen waste and manure. The majority of farmers who used organic wastes (48) used it raw (untreated). Only 13 farmers treated the waste before using it. Treatment techniques included mixing chicken droppings with sawdust, allowing it to dry and spraying it on the beds to be planted (Photo 7). Others added cow

dung to crop residues, leaves and shrubs into a compost heap (Photo 8) added water to the pile, turned it periodically until it decomposed and ploughed the compost into the soil before crops were planted.

The practice of using untreated waste could create serious environmental and health problems. As shown earlier in this section, most farmers felt reluctant to use organic waste because of the problems of odor and rodents. Certainly, if farmers engage in using untreated waste, the likelihood of disease, rodents and odor will be high. Referring to section 2.7.2 of Chapter 2, these are some of the major problems which militate against reusing organic waste in urban farming in African cities. These problems give urban cultivation a bad image, create a "NIMBY" attitude among urban residents, and in situations where urban cultivation takes place in middle and high income neighborhoods due to availability of space, residents in such areas who are politically and economically powerful could easily put pressure on city administrators to ban farming activities in the city. As the outgoing mayor of Accra indicated, "if it is revealed that farming in the city poses environmental and health risks to urban residents as a result of using untreated wastewater or any organic wastes, my outfit will not hesitate putting such farmers out of business" (Personal Communication, 1997).

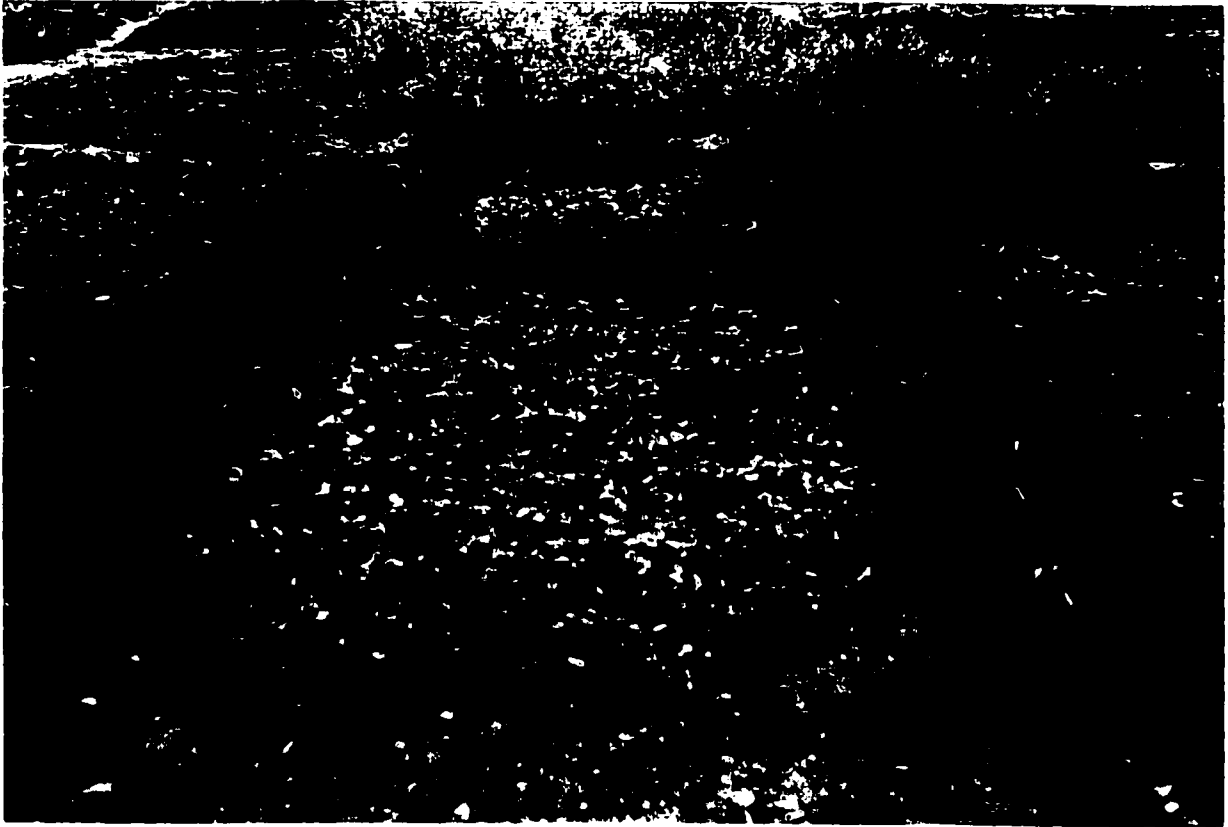


Photo 7: Chicken manure mixed with sawdust and spread on vegetable beds before cultivation



Photo 8: A farmer standing on a compost heap he has built himself

Most cultivators (63) did not use compost on their farms; only 24 farmers did use compost, and out of this number 13 indicated having composted before. The rest, including those who did not use compost, have never composted before. The compost was mostly obtained freely from abandoned waste dumps (Photo 9). They could not state the quantity of compost they use in a month or year since they do not keep records. Most of these farmers had never heard of the Teshie centralized composting plant located in the western end of Accra, and none of those farmers who did use compost obtained their compost from the plant. The (17) farmers who did know of the existence of the composting plant stated that they learned of it through friends, extension officers and the Waste Management Department. As discussed in chapter 2, the Teshie plant was built to compost 200 tons of Accra's municipal solid waste daily, and farmers in the city were supposed to benefit from the compost produced; if these farmers were not aware of the existence of the plant, it is an indication of poor marketing on the part of the Waste Management Department and the Accra Metropolitan Authority. This is consistent with Asomani-Boateng's (1994) finding that poor marketing is a major constraint to the successful operation of the Teshie plant. Others like Ngom (1989) and Asade (1991) noted that the absence of an established market for compost is a major factor which has contributed to the failure of other centralized composting plants in Africa. The issue is not the absence of a market for compost: the root of the matter is the failure or inability of operators of centralized composting plants (municipal authorities) to market the compost produced, for there is a large potential market for compost in Africa. How to access this market is the problem.



Photo 9 : A farmer harvesting compost from a waste dump



Photo 10: A group of unemployed men harvesting compost from a dump to sell

Fifty-nine farmers stated they preferred to use compost instead of artificial fertilizers, 25 did not prefer the use of compost and 3 did not respond to the question. Those who favoured the use of compost stated that compost is less harmful than artificial fertilizers, because chemical fertilizers, like NPK 15/15, and Urea, are corrosive to the skin. They also stated that compost could be obtained freely from abandoned waste dumps. Those who preferred to use artificial fertilizers explained that they had not been aware that compost could be used in farming, or did not have any knowledge about and experience in composting. As demonstrated in chapter 2, colonial and post-colonial governments have abandoned such indigenous practices, which have therefore become entirely forgotten, as Hauck (1978) points out: *"in many countries that have recently been increasingly dependent on mineral fertilizers, the technical knowledge of organic waste utilization has been lost. It is thus necessary to reintroduce the established techniques, to improve them, and to develop new practices conforming to modern technology"*.

Asked if they would be willing to compost household waste and use the compost on their farms, 82 farmers from the three farming groups said that they would, and the remaining 5 would not because they had full time jobs in addition to farming, and could not take on extra work.

5.3.5 Expenditure on farming inputs

Table 5.4 gives an indication of farmers' expenditure on major farming inputs, land, water, seed labor, manure compost and agro-chemicals.

Table 5.4: Yearly expenditure on Farming Inputs

PERI-URBAN				
Input \ Amount (Cedi)	Free	<40,000	60,000-100,000	>100,000
Land	27	-	-	1
Water	25	-	-	3
Seed	9	15	-	4
Labor	8	3	10	7
Manure	13	3	2	1
Compost	8	1	1	-
Agro-chemicals	-	2	4	5
VACANT SPACE				
Land	26	1	1	-
Water	21	-	2	5
Seed	5	7	3	13
Labor	22	2	2	2
Manure	17	7	4	-
Compost	2	1	1	1
Agro-chemicals	-	7	3	5
HOUSEHOLD				
Land	30	1	-	-
Water	28	3	-	-
Seed	12	18	-	1
Labor	22	8	1	-
Manure	17	1	-	-
Compost	9	-	-	-
Agro-chemicals	-	4	-	-

Source: Survey Data, (1998).

It is evident from Table 5.4 that almost all farmers in the three farming groups (83) do not pay rent for cultivating the land on which they farm. The remaining 4 farmers, 2 from vacant (1) and household (1) farming systems, paid less than 40,000 cedis yearly on rent. One vacant-space cultivator indicated paying between 60,000-100,000 cedis a year on rent. The only farmer who paid more than 100,000 cedis a year on land rent was from the peri-urban farming group. The above analysis shows land rent not to be a critical issue facing cultivators in Accra. The question one has to pose is, what will be the implication of such a practice (of using land without paying rent) in promoting waste reuse urban cultivation? This question is examined in the discussion section of the thesis.

Seventy-four farmers did not pay any money for using water. This is to be expected since, as revealed in section 5.2.6 of this chapter, cultivators in the city tend to locate near streams and drainage channels where they have access to free water. 3 peri-urban farmers indicated spending more than 100,000 cedis yearly on water. 3 household cultivators stated that they spent less than 40,000 cedis on water yearly, while 2 vacant-space cultivators spent between 60,000 and 100,000 cedis a year on water. Finally 5 vacant-space farmers indicated that they spent more than 100,000 cedis a year on water. Cultivators who spend money on water are those who rely on piped water.

Yearly expenditures on seeds vary among the three farming systems. 9 peri-urban, 5 vacant-space and 12 household cultivators indicated that they obtain their seed from friends and relatives, and use seeds that were saved from the previous year's harvest. 15 peri-urban, 7 vacant space and 18 household cultivators indicated that they spent less than 40,000 cedis a year on seeds. 3 vacant-space cultivators revealed they spent between 60,000 and 100,000

cedis a year, while 18 farmers from the three farming systems spent more than 100,000 cedis a year on seeds: peri-urban (4), vacant (13) and household (1).

Still, as table 5.4 indicates, as many as 13 peri-urban, 17 vacant- space and 17 household cultivators did obtain free manure for use on their farms. Of those who did spend money on manure, 11 farmers from the three farming groups indicated they spent less than 40,000 cedis a year on manure, 6 spent between 60,000 and 100,000 cedis a year on manure and only 1 peri-urban cultivator spent more than 100,000 cedis a year on manure.

Table 5.4 shows that 11 farmers spent less than 40,000 cedis a year on agro -chemicals (fertilizers, pesticides, and insecticides). 7 spent between 60,000-100,000 cedis a year and 10 spent over 100,000 cedis a year on agro-chemicals. With regard to the use of compost, 19 farmers from the three farming categories obtained the compost they used on their farm at no cost and, 2 peri-urban and vacant space cultivators indicated that they spent less than 40,000 cedis a year on compost while 2 farmers from the same farming systems spent between 60,000 and 100,000 cedis yearly on compost.

Expenditure on labour varies with farming type. While a significant number of peri-urban cultivators (20) indicated they spent between 40,000 and 100,000 cedis and above on labour only 6 vacant space and 9 household cultivators spent between 40,000 and 100,000 cedis a year on labour. Forty-four cultivators from the vacant and household farming categories did not spend money on labour compared to only 8 peri-urban farmers who also did not spend money on labour.

The expenditure analysis indicates that farmers prefer to acquire farming inputs for little or no payment. The urban cultivator in Accra does as much as he can to reduce the cost of his

operations by doing most of the work himself, by relying on family members and friends for inputs like seeds and implements and generally purchasing low quality and inexpensive inputs. Farmers complained that the application of low quality cheap pesticides often resulted in the destruction of their crops and poor health. Banned agro-chemicals are being sold cheaply to farmers who find cheap inputs attractive.

5.3.6 Benefits of urban cultivation

A significant number of household cultivators (21) indicated that they cultivated purposely for home consumption while 1 peri-urban and 2 vacant- space cultivators gave the same reason for cultivating in the city. Twenty-six peri-urban, 17 vacant-space and 9 household cultivators stated they cultivate purposely for sale and for consumption while 9 vacant space farmers indicated that they cultivate purposely for cash income.

Asked about the amount of money they realize a year from the sale of their farm produce, 34 farmers from the three farming systems were unable or unwillingly to provide figures. Household/backyard cultivators (21) indicated that they cultivate purposely for home consumption , and hence did not sell their produce. Three peri-urban and 10 vacant space cultivators refused to reveal their earnings from the sale of their farm produce for the simple reason that they thought their earnings were being documented for tax purposes, since at the time of the survey the Ghana government was in the process of introducing Value Added Tax (VAT) in the country.

Twenty-seven farmers revealed their earnings, from the three farming categories. 10 peri-urban, 7 vacant and 10 household cultivators each revealed they earned around half a

million (500,000)cedis⁴ a year. 7 peri-urban and 4 vacant space cultivators earned between half a million to one million cedis a year. 6 peri-urban and 6 vacant space cultivators stated they earned between one million and three million cedis yearly. Finally (2) peri-urban and (1) vacant space cultivator earned between three million to over four million cedis a year from the sale of their farm produce.

5.3.7 Status of and problems with urban cultivation

An important issue which needs to be examined is the status of urban farming in Accra. The historical analysis of urban farming done in section 1.7.5 of chapter 1 indicates that urban farming is an age old activity in Accra, and is at the moment widely practised in the city. Sackey (1998) reveals that almost all of the 2522 hectares of available cultivable land in the metropolis is being farmed and estimates there are between 3550 and 4000 farmers farming in the city. The actual number of farmers is greater than the number stated above, for the simple reason that in every home and on any unused space in the city some form of urban farming takes place, and during the rainy season almost every resident in the city is a farmer.

Cultivators in Accra encounter a number of problems in their farming operations. Finding land was the most common problem mentioned by farmers from the three farming systems. Twenty-two farmers mentioned the lack of suitable land as a major problem confronting farmers in the city. The land issue has many dimensions. The first is their lack of tenure or security regarding the land on which farmers cultivate. The absence of usufruct has created fear among farmers that they could lose the land on which they farm at any time.

⁴ One cedi was equivalent to one thousand six hundred Canadian dollars at the time of the survey

Discussions with some farmers revealed that since they do not possess tenure rights they have been subjected to threats of eviction by wealthy individuals. The result is that they have been unable to protect their farms and challenge the individuals who have been harassing them. The general perception among the farmers was that they were likely to lose their land, and this fear is heightened by the practice of selling land which has gripped the city lately. As Sawudatu et al. (1998) points out:

"If land selling continues at such a fast pace, gradually all lands would be lost to housing, land is being sold to people who can plant houses rather than crops"

Another aspect of the land issue was the availability of suitable land at suitable locations for farming purposes. In the absence of these factors they were forced to farm on marginal land. The analysis of farm sizes indicated that farms in the city are generally quite small. On average, farmers cultivate less than one acre. Household and vacant space cultivators indicated their inability to expand their gardens because of limited space.

A second major problem identified was the expensive nature of urban cultivation. The high costs of seeds, fertilizers, insecticides and pesticides increase the cost of farming operations, as indicated by 14 farmers who stated that it was expensive to operate farms in the city.

Another major problem mentioned by 13 farmers from the three farming categories was theft. Farmers who revealed stealing to be a problem came from the household farming category followed by vacant space farmers.

Droughts and floods were reported by 11 farmers as serious problems. The location of farms in wetlands and along streams and drainage channels subject these farms to floods, particularly during periods of heavy rains, while the occasional drought leads to poor harvests. A few farmers who are connected to the city's piping system complained bitterly of high water bills.

Another problem revolves around the issue of marketing farm produce. The marketing of farm produce is characterized by profound fluctuations in prices resulting from supply and demand inequalities. Usually, the market women who buy the majority of the produce offer ridiculously low farm-gate prices, which are not commensurate with the efforts of the farmers who, since they have no alternative, must reluctantly accept the low prices. Furthermore, by insisting on buying whole beds of vegetables, market women deny the farmers use of the beds until the crops are harvested. Hence, most of the farmers appealed to the city authorities to grant them stalls at the various markets to sell directly to consumers.

Diseases, pests, bad seeds, the destruction of crops by stray animals, poor quality agro chemicals, inexperienced and inadequate extension officers (who, the farmers complained, are not friendly and tend to look down on them) were some of the problems mentioned by farmers. Farmers explained that because there weren't enough extension officers they were unable to access their services and tap the expertise of these officers for their farming operations, particularly in the application of fertilizers, pesticides and insecticides. Ultimately, farmers are applying these chemicals without any technical advice, resulting in the incorrect application of these agro-chemicals, with its negative consequence for the environment, and for the health of farmers and consumers of farm produce.

The use of farms as defecating grounds by some residents, declining soil fertility, and evidence of soil erosion were problems mentioned by farmers. They revealed that farming in the city is labour- intensive; it saps their energy and impacts negatively on their health. Added to the above are injuries resulting from cuts and snake bites. These health problems require treatment, but since hospital services in the city and the country in general are so expensive, most farmers are unable to go for treatment and the result has been fatal in some situations.

5.4 Nature and Utilization of Organic Solid Waste in Accra

Section 1.7.8 of chapter 1 reveals the nature and characteristics of organic solid waste in Accra. Table 5.5 is 1991-93 survey of solid waste characteristics in the three areas of Accra

Table 5.5: Waste Generation Characteristics in Accra

AREA	Low	Medium	High	Accra
Total Population (1994)	1,044,880	324,760	42,360	1,412,000
Percentage Share	74	23	3	100
Generation per capita (kg)	0.40	0.60- 0.76	0.62	0.47
Density (kg/l)	0.50	0.24	0.21	0.43
<u>% Composition (Weight)</u>				
Organic	49.1	73.0	72.6	55.3
Inert	41.2	12.1	8.9	33.5
Plastic	2.7	3.0	4.0	2.8
Glass	0.4	1.2	2.0	0.6
Paper	3.5	6.0	7.2	4.2
Metal	0.7	1.7	2.8	1.0
Textile	2.1	2.4	1.5	2.2
Other	0.3	0.6	0.9	0.4
TOTAL	100.0	100.0	100.0	100.0
Compostable (%)	90%	80-90%	80%	88.6%
Recyclable	76%	8-17%	18%	8.9%
Quantity (tons) per day	412.3	220.8	26.3	659.4
Percentage Share	62.5	33.5	4.0	100

Source: Waste Management Department (WMD), 1995.

In the low class areas, specific generation rates average about 0.4 kg/capita/day and 0.8 kg/capita/day with a density of 0.5 kg/l. The compostable fraction of waste generated from this area is about 90 per cent, with the organic content averaging 50 per cent and inert materials 40 percent. Recyclable materials, which include plastics, paper, unbroken bottles and metallic objects average up to 7.6 per cent. The estimated total quantity of waste generated from this area amounts to about 412 tons, hence, the bulk of the city's waste is generated in this area.

Within the medium class areas waste generation rates range between 0.6 and 0.76 kg/capita/day. The compostable portion ranges from 80-90 per cent with about 70 per cent organic. The estimated quantity of waste generated in this area is around 221 tons daily.

High- class residential sectors in Accra generate a total of 26 tons of waste daily. Generation rates range between 0.62kg/capita/day and 2.95kg/capita/day, with densities averaging about 0.21kg/l. The compostable fraction is over 80 per cent, with recyclables constituting up to 18 per cent.

5.4.1 Current utilization of organic solid waste

It is estimated that around 540 tons of about 700 tons of solid waste generated daily in the city of Accra is compostable. The question is, is this compostable fraction used at all? The city's centralized composting plant, which was built to compost 48,000 tons of compost yearly, turns out only 4,000 tons of compost annually, which is sold to horticulturalists, private companies and a few vegetable growers and farmers. Furthermore, livestock and pig farmers use organic solid waste in the form of food, vegetable, and kitchen waste generated by institutions, markets, restaurants and residential areas as feed for livestock, but the quantities used are not known: the accumulation of solid waste in markets, residential areas and drains is an indication that quantities of solid waste used are so small they do not represent a significant reduction of the amount and quantities of waste to be collected and disposed of. As shown in this chapter, there is also extensive use of organic manure in the form of chicken droppings and cow-dung manure, but the same is not true of food, vegetable and kitchen

waste. It is clear from the above analysis that an insignificant quantity of the city's compostable waste is utilized; the bulk of the compostable waste is, lost.

5.5 Farming Areas

Urban cultivation, as shown in section 1.7.5 of chapter 1, permeates both the city of Accra (vacant space and household/backyard cultivation) and its suburbs (peri-urban cultivation). In Accra, as already shown in chapter 1, urban cultivation takes place in and around homes in middle and high- income residential areas and in areas reserved for open spaces and parks, and in peri-urban areas of the city (See Fig 1.3)

Household/backyard cultivation, as indicated above, is undertaken in medium and high-income residential sectors of the city: Dansoman, Cantonments, Roman Ridge, Achimota, Dzorwulu, Dome, Abelenkpe, Airport Residential Area, Labone, Legon, Taifa, North Kaneshie, Burma Camp, Odorkor and Teshie Nungua Estates.

Areas reserved as open spaces and which are intensively farmed include public and private spaces. Public spaces include roadsides and the side of railway tracks, rights of way, under electricity transmission lines, the airport, wetlands and stream banks. Private spaces include land in the city's industrial zones. There are about 29 locations which fall under the public and private space category: Plant Pool, Odawna (Adabraka), Abbosey-Okai, Kotoka International Airport, Roman Ridge, Kaokudi, Marine Drive, Cantoments, Korle-Bu, Awudome, Avenor, Dzorwulu, Abelenkpe, Teshie, Fulani Village, Yooma , Burma Camp, Su Tsuru, Tsuibleo, Labone, Dansoman, Nungua Barrier, the Wireless Laboratory, Sakaman, Odorkor, Togo, Lartebiokorshie, and Alajo .

Peri-urban cultivation is undertaken in areas like Kasoa, Tuba, Ofankor , Kwabenya and Madina. It must be emphasized that attempting to map the overall pattern of cultivated plots in Accra is extremely difficult, if not impracticable, because the plots are very numerous, frequently small, and keep changing.

5.6 Findings From the Survey of Urban Management Institutions, Major Waste Generators, Potential Users of Compost and Aid Agencies

This section presents findings from the survey of the city's urban management institutions, major waste generators, potential users of compost and aid organizations. The findings are based on both qualitative and quantitative analysis of data and information obtained from key informants from the above institutions. The survey sought to identify these institutions' awareness of major environmental problems facing the city of Accra, their perception about urban farming and the practice of reusing organic solid waste in urban cultivation, and their preparedness to promote the concept of waste reuse urban farming. Obtaining this information is critical to developing a framework for reusing organic solid waste.

5.6.1 Urban environmental problems

All 32 institutions surveyed agreed that the city of Accra is experiencing serious environmental problems. They noted that waste disposal and collection are serious environmental problems, followed by poor sanitation, poor drainage, flooding, heat, smoke, and congestion.

Twenty-five of the institutions interviewed, indicated that the city's waste management has been effective in addressing its waste collection and disposal problems. These included urban management institutions (11), waste generators (9), potential users of compost (3), and aid organizations. Seven of the remaining institutions felt that the city's waste management system has been effective. Twenty-eight of the respondents saw the waste problems as very serious, while the remaining 4 viewed it as only somewhat problematic. It was also discovered that Accra's waste problems were confined to the city's poor neighborhoods and open indigenous markets. Respondents were of the view that poor refuse collection and disposal leads to the spread of diseases, increased rat populations, offensive odours, and general uncleanliness in the city.

5.6.2 Urban cultivation and organic solid waste recycling

Asked if it is appropriate to allow people to farm in the city, 18 institutions viewed farming in the city as acceptable and felt that it must be promoted because it provides food, income and job opportunities to urban residents. Fourteen opined that it is not appropriate to allow farming in the city for a number of reasons: farming is a rural endeavor and should not be encouraged within city limits, the use of contaminated waste water in irrigating crops poses a potential health risk to urban consumers, farms breed mosquitoes, and there is not enough land for housing in the city, let alone for farming.

On the issue of institutional support to promote urban farming, 15 institutions indicated their preparedness to promote urban cultivation in Accra through organizing farmers, sensitizing residents to urban farming by educating them on the benefits of urban farming,

providing financial assistance and farming inputs to urban farmers. The 17 institutions did not give any response.

Concerning the level of awareness of institutions regarding the use of organic waste in urban farming, all the institutions stated that they were aware organic waste could be used as a soil conditioner in urban cultivation. Twenty-six institutions indicated their willingness to promote the reuse of organic solid waste in urban farming but could not state how they intended to promote the concept. The remaining 6 institutions were unwilling to promote the concept. To them the idea of promoting urban cultivation and composting of organic solid waste in city like Accra is just not right for the mere reason that these are rural activities.

On source separation, a significant number of institutions (25) expressed their willingness to help promote source-segregation of waste at the household level by providing: financial support (7), collection of source -separated waste to composting sites (5), bins for source separated waste (5), and education about source separation (11). 2 did not respond to the question, and the 5 remaining institutions, mostly foreign aid organizations, could not support and promote source separation because it is not within their mandate. They operate by rules and the rules do not allow them to engage in such activities.

On composting, 27 institutions indicated their preparedness to help promote the concept of composting by providing financial support, transportation, and a market for the compost produced. The remaining 5 institutions were not in a position to promote composting because they felt it was the sole responsibility of the city's waste management department.

The perception about crops grown with waste is extremely important in promoting the concept of reusing waste in urban cultivation, in that it has been shown that negative

perceptions about waste grown food do impact negatively on the demand for these types of food (Furedy et al, 1997). This study sought to explore the perception of these institutions about waste- grown food. 4 institutions stated their preference for food grown with fertilizers because they saw it as hygienic, and 20 did not indicate any preference. 8 preferred waste grown food because they felt that food grown with waste is better for not being contaminated by chemicals, and that taste and nutritional value are thus improved. Furthermore, 25 institutions stated that they will tolerate the reuse of waste in urban farming provided the waste is treated and will not pose any health risks to residents. 7 institutions indicated that they will not tolerate waste- based urban cultivation because it is unhygienic and could pollute the environment.

5.6.3 Policies and programmes

All the institutions, with the exception of the Waste Management Department (WMD), did not have any policy or program on reusing waste in urban cultivation. The WMD composts an insignificant fraction of the city's waste to be used by horticulturalists and institutions. These institutions identified a couple of barriers to waste- based cultivation. 4 institutions asserted that the perception that waste based cultivation is a rural endeavor and not suitable for the urban setting is a critical problem. The health problems associated with urban cultivation, which result from the use of untreated waste, was seen as a major barrier to waste-based cultivation by 5 institutions; finally, 8 institutions indicated the absence of urban policies to promote waste based cultivation as a major limiting factor.

5.7 Findings from the Community Composting Pilot Project

The findings of the community composting demonstration project are examined below.

5.7.1 Participation

The source separation project started with 12 households in the first week of February, 1998; within a week the number of participating households had increased to 32. Within a period of over two months it was discovered that only 14 households were regularly source separating their household waste into compostables and non-compostables; the remaining participants on several occasions mixed both streams together and dumped them at the composting site. These households maintained that it was their first time separating their waste and they were unfamiliar with the practice. In some households, children were responsible for dumping household waste at the dump, and these children often found it cumbersome to make two trips to dump the non-compostable waste at the dump and to send the compostable waste to the composting site. To avoid making two trips they would mix both streams and dump it at the composting site. This problem of mixing the two streams was common in households who had to send their source-separated waste to the composting site. In households in which volunteers picked, and in those where the elderly women were responsible for conveying the waste to the composting site, this problem was very minimal.

These findings raise some issues with regard to what collection technique to adopt, where to locate the site, what distance is acceptable, and who will take on various tasks.

All the participants complained about the lack of incentives which might discourage residents from participating in the project in the future. A follow-up informal discussion with the thirty-two households about what will motivate them to continue as well as attract other households

in the community to participate in the source separation project confirmed the need to provide incentives, especially financial incentives. Even though participants were aware of the environmental and health impacts of the project, they were less enthusiastic about these impacts than they were about the economic benefits to be derived from the project. The participants explained that they are poor, do not have stable jobs, and always have to spend hours either at the stone quarry cracking stones or engaged in trading in order to feed their families. For them, life in the community and the city as a whole is a daily struggle. To spend one's precious time source separating household waste, which is tedious and time-consuming, without any economic benefit but just for environmental and health reasons, is an exercise not worth pursuing. This question of providing incentives was also raised by volunteers who composted the source separated waste.

It was also discovered that some households did mix human feces with the compostable waste, while some children used the site as a defecating ground.

5.7.2 Waste generation and diversion rates

Total household waste generated by the thirty-two participating households over a period of 28 days (March 5 to April 1, 1998) was 2240kg. Out of the 2240kg of waste generated by participants 2016 kg was diverted from the community waste stream and composted. Waste which would have ended up in the community dump was turned into an important resource to be used in food cultivation.

5.7.3 Compost quality and trial

Results of the compost analysis indicate the compost to be of a very high quality. Table 5.6 indicates the major nutrient content of the compost produced from the community composting pilot project.

Table 5.6: Composition of Compost

Substance	Composition by % weight on dry basis
Organic matter	30
Nitrogen	1.3
Phosphorous	7.8
Potassium	1.7
pH	7.7

Source: Survey data (1998)

From table 5.6 above, organic matter, phosphorous, potassium and nitrogen are very high according to standards produced by the Waste Management Department of the Accra Metropolitan Assembly (1995) and Dalzel et al. (1987). It must be emphasized at this point that organic matter is considered to be the single most important indicator of soil quality (Larson and Pierce, 1991). Organic matter is known to bind trace metals into organic complexes, and helps soil particles bind into crumbs, and increases the number of earthworms which burrow through the soil: as these passages form, they decrease the bulk density of the soil, and increase soil's porosity and permeability to air. These changes allow easy penetration of plant roots and percolation of rain water; hence, the presence of organic matter helps the soil to absorb considerable quantities of water, thereby increasing water and air retention capacity. Furthermore, it reduces the rate of water evaporation into the atmosphere (Gregorich

et al., 1993; Dalzell et al., 1987). From a plant nutrient standpoint, organic matter serves as a store house for plant nutrients like potassium, nitrogen, phosphorous, sulphur and zinc (Mehring and Bennet, 1950; Thompson et al., 1954). Test trials of the compost by farmers were very encouraging. The few farmers who are using it indicate that their plants look stronger; the stems are big and the leaves are very green (See photo.11)

5.7.4 Cost

The cost of initiating and implementing the pilot project was examined based on input requirements. The inputs were in the form of labour, land and equipment (tools). Labour costs took the form of financial incentives given to the eight volunteers who organized the project. Equipment included wheelbarrows, shovels, rakes, containers, a weighing scale, and boots and gloves for volunteers. Land cost was in the form of clearing and fencing the composting site. One thousand six hundred Canadian dollars was the total cost for initiating the pilot project.

5.8 Environmental, Economic, Social, and Institutional Constraints and Opportunities regarding Waste Reuse Urban Cultivation

This section examines the third objective of the study, which involves the examination of environmental, economic, social, institutional and cultural opportunities existing in Accra which could be exploited to promote waste- based urban cultivation, and constraints which could limit the promotion of waste based urban cultivation. The analysis draws on the findings from the survey of farmers, urban management institutions, major waste generators, potential users of recycled organic waste and the community composting pilot project.



Photo 11 : Seedlings grown with compost

The widespread use of chemical insecticides, pesticides, herbicides and other agro chemicals in a densely- populated area by farmers who do not have any training in the use of these chemicals, and where most of them do not benefit from the city's extension services, could lead to the misuse of these chemicals, consequently creating serious environmental and health problems. Because most of these farms are located near streams and creeks, the likelihood of pollution of these water bodies, resulting from these chemicals is very high. In addition, these chemicals could accumulate in crops grown by these farmers, posing potential health problems to consumers.

Equally serious is the use of untreated waste water and other forms of organic manure which could also create serious health problems to urban residents, including farmers. Such practices create a bad image for waste based urban cultivation, which leads to city officials either regulating such activities or banning them entirely, as the former mayor of Accra warned (see section 5.3.4 of this chapter). On the other hand, the abundance of organic solid waste which is not being used by the significant number of urban cultivators in the city suggests that it is important to promote the concept of waste reuse urban cultivation.

Effective waste reuse requires the separation and composting of organic solid waste, but as demonstrated by the community composting pilot project, participants lacked knowledge about this process. Ultimately, these issues, if not addressed, constitute a major limitation to promoting waste-based urban cultivation. Negative attitudes and inhibitions towards food grown with waste are known to be major constraints to waste reuse urban cultivation, but as demonstrated in this chapter, key informants of urban management institutions, major waste generators, farmers' associations, households, potential users of

recycled waste and foreign aid institutions do not really care about reusing waste in urban cultivation; their only concern is that if provided, it must not affect health. Because farmers in the city have a long tradition of, and experience with using waste in urban farming, it would not be difficult to introduce them to new techniques of using waste in urban farming. It was demonstrated through the community composting pilot project that illiterate and formally uneducated farmers, women, households and community members can very quickly learn techniques if they are actively involved in demonstration projects.

The presence of community groups, extension services department, farmers' associations, NGOs and Metropolitan Department of Food and Agriculture, coupled with the political commitment on the part of the national and municipal government to promote urban farming create opportunities which can be exploited to promote and advance waste based urban cultivation. The rapid uncontrolled expansion of the city, as shown in chapter one of this thesis, is a major problem which could undermine the concept of waste reuse urban cultivation. Accra is sprawling at an alarming rate, becoming larger and more dense, and in the absence of enforceable land use regulations, policies and programmes to protect urban farm lands from conversion into other uses, the concept of waste reuse urban cultivation is threatened.

The impact of sustainable urban development and urban management concepts examined in chapter three of this study which have been adopted in Accra with the implementation of the Healthy City Project, coupled with the interest in assessing solid waste management in the light of the potential for waste reduction through organic waste reuse, and

greater interest in food security in the city's urban development, have created an enabling environment for the promotion of waste based urban cultivation.

The presence in Accra of a potential market for compost, and the high prices of chemical fertilizers resulting from the withdrawal of government subsidies under the structural adjustment program, are forcing farmers in the city and the country as a whole to seek out alternative forms of soil amendments, as evidenced by the widespread use of organic materials in the form of cow dung and chicken droppings. Such developments have created a favorable environment for the promotion of waste-based urban food cultivation. On the other hand, the production of expensive compost which is poor in quality as a result of contamination could be a major limitation to promoting the reuse of waste in urban cultivation.

5.9 Summary and Discussion of Findings

This section summarizes the findings of the study. These findings are examined below:

- 1. Urban cultivation in Accra is an age-old activity which is permanent, stable and continues to expand and offer job opportunities to a significant number of fairly young urban residents. It is a predominantly male activity, and is mainly undertaken by migrants from the various ethnic groupings in Ghana.**
- 2. Availability of water and cheap fertile land, as well as proximity to farmers' residences, are major locational factors which influence farmers' locational decisions.**
- 3. The reasons for involvement in urban food cultivation include providing a source of food for direct home consumption and sale of produce for cash income.**
- 4. Farmers in the city spend more on seeds and agro chemicals than on land, labor, water and organic manure.**
- 5. Vegetables constitute a significant proportion of crops grown in the city**
- 6. Farming in the city takes place in peri-urban areas and in vacant spaces in the built areas and within and around homes.**

- 7. The practice of using untreated waste in the form of waste water, cow dung , and chicken droppings is common but the use of compost is not widespread and is confined to only a few farmers, horticulturalists, households, and government ministries and departments.**
- 8. Fertilizer use is increasingly becoming uncommon and a greater percentage of farmers prefer to use compost instead of fertilizers and are willing to compost household organic waste and use it on their farms.**
- 9. Urban cultivators lack experience and knowledge in the art of composting.**
- 10. A significant proportion of the city's organic solid waste which can be composted is not put to use.**
- 11. Reusing organic solid waste in urban cultivation can divert enormous quantities of waste from the city's municipal waste stream.**
- 12. The availability of incentives, familiarity and knowledge about source separation and composting, and collection systems used impact on participation rates and the sustainability of community-based source separation and composting projects.**
- 13. There are virtually no policies and programs designed to promote waste reuse urban cultivation in Accra.**
- 14. Farmers in the city are confronted with a host of problems in their farming activities.**

There are certain critical issues which need to be examined in light of promoting the concept of waste reuse urban cultivation in Accra and other African cities. Land is central to waste reuse urban cultivation in that both activities, composting of organic solid waste and urban cultivation, require land. Across Africa, evidence abounds that finding adequate land in suitable locations, as demonstrated in this chapter, has been a major problem facing urban cultivators. In peri-urban areas, intense pressure on urban land for various competitive uses, such as residential, industrial and commercial uses, is shrinking agricultural land. In the face of such intense pressures could agricultural land be preserved and protected? Can farmers

afford to pay market rent to acquire land, notwithstanding the fact that farmers in the city pay virtually nothing for the land on which they farm? And if there is the need for intervention, what forms of intervention are needed and whence should the intervention come . To examine these questions, a careful examination of the supply of land in the city, focusing on land ownership, is required.

In Accra and Ghana in general there are three forms of land ownership: customary (stool and family), private, and state vested. Customary ownership constitutes 80 per cent of land in Accra (Odame-Larbi, 1996). The basic fundamental principle upon which ownership of land in Ghanaian traditional community is founded on collective ownership, hence stool and family lands are lands which are at the disposal of the community or family, or lands or interests in land which is controlled by a person or body of persons for the benefit of their subjects or by a tribal or family head for the benefit of their family, tribal or company members. State and private lands are lands acquired by the state and private individuals or organizations from the customary owners. Given this background, the supply of land in the city falls under customary, state and private ownerships. Subdivision layouts prepared by customary and private landowners are devoid of public utility sites such as open spaces, community centers, school sites, health centers and markets. To maximize their earnings from the sale of land, every available space is subdivided into residential plots and sold; leaving spaces for public utility purposes is seen as an unprofitable practice. Added to this is the fact that these owners sell only to the highest bidders, who are usually residential and commercial developers. Left on their own, will customary and private land owners be willing to provide land in the city for cultivation and composting of organic waste for nothing ? The answer is no. That significant

number of farmers, as shown in this chapter, farmed on private lands does not indicate that such lands have been earmarked for agriculture. The point is that for whatever reason these lands are not ready for development, but in the course of time, when they are ready for development, these farmers will have to leave the land. It is no wonder that urban agriculture in African cities has come to be viewed as a transitory activity or is associated with what Keene (1996) has characterized as "the impermanence syndrome," a belief that farming is only an interim use that will cease when the land is ripe for development.

It must be noted that implementing the waste reuse urban cultivation concept will run into problems if urban farmers are expected to purchase land in suitable locations for farming and composting organic solid waste. A number of studies have shown that the extremely low income of households, make it virtually impossible for a majority of urban households to purchase land (Grimes, 1974; World Bank, 1975; Marris, 1979; Linn, 1982). Hence for a successful implementation of the WRUC concept, access to land, especially by low- income urban residents, must be provided. This will require major suppliers of land in the city of Accra - customary, private and state. For customary and private suppliers to make land available for cultivation and composting or recycling of organic solid waste this will require a strict regulatory regime whereby the city government enacts by- laws for the creation and protection of WRUC zones in any subdivision prepared by the state, customary and private land owners. One may ask, how are such regulations going to be effective given the weak enforcement rate of by-laws in the city as indicated in section 1.8.2 of chapter 1. Recent developments in the city, whereby city authorities demolished structures built in open spaces and other areas not designated as residential, suggest a positive trend. This kind of strict

enforcement of land use and zoning regulations is needed to create, preserve, and protect WRUC zones in the city.

Any discussion about waste reuse whether waste water , manure and semidry (human feces and urine) always draws attention to the health risk involved in such practices. The issue of health risk constitutes a major constraint to waste reuse urban cultivation in Africa and other developing countries. But studies on health risks-- the "Engelberg Standards" (IRCWD, 1985), WHO's (1989) health guidelines for the use of wastewater in agriculture and aquaculture, Mara and Cairncross (1989), Shuval (1990) and Strauss and Blumenthal (1990) have focused on waste water reuse, emphasizing quality standards and guidelines. It needs to be emphasized that research on health risks on organic solid waste reuse in urban cultivation is lacking. Equally absent are studies on the health risks associated with the consumption of waste reared products, crops, animals and fish. In the absence of any studies, conclusions drawn are based on assumptions. This is not to suggest that reusing organic solid waste in urban cultivation could not create health problems; the author merely points out that studies to identify specific health problems, so that these problems could be monitored and regulated are absent. If the health risks are not better understood and control measures found and promoted, diseases will increase and reusing organic solid waste will intensify the situation.

Central to the waste reuse urban cultivation discussion is the issue of competition between rural and urban farming. Urban agriculture is viewed by some as an alternative to, or in competition with, rural agriculture. Critics assert that large- scale promotion of urban farming will compete with rural farming, eventually depriving rural residents of their source of livelihood and culminating in the collapse of rural economies. This assertion is debatable,

for one has to examine this point in light of what is being produced and quantities involved. Production figures on urban farming in African cities is lacking; most figures quoted in the literature are estimates, and even though significant quantities of certain crops are grown in African cities, they cannot be seen to undermine rural production. Added to this is the fact that most of the crops grown in urban areas are vegetables which are not grown on a large scale in rural areas. It is becoming increasingly clear that the ability of the rural areas to supply food to urban areas is weakening. Desertification due to bush fires, and declining soil fertility is one problem; furthermore the emphasis on the production of cash crops like cocoa, coffee, and palm oil to generate foreign exchange has seen farmers switching to the production of cash crops to the detriment of food crops. In war ravaged countries like Sierra Leone, Angola, Mozambique, and Rwanda, rural areas have been turned into battlefields, fields have been mined, and rural farmers have been displaced, making it virtually impossible to farm in these areas. The result is the widespread starvation that has been reported in these countries. In such countries, and in African countries in general, urban farming would serve as a supplement to, or fill in the gap left by, rural food production.

Urban land use planning and agricultural use seem to be in conflict. As already demonstrated, colonial urban planning of African cities, which has been widely adopted by contemporary African planners and city administrators, never accommodated agriculture as a major urban land use for various reasons, and the distinction between "Town" and "Country" is proof of this. Against this background it has been shown that pre-colonial African cities had agriculture as a major land use. But when it comes to city building and city planning, Africans never engaged in these activities. African cities, it is believed, were colonial creations as

espoused by the "Hamitic" hypothesis, which states that "Africans never built cities, most African towns are new and owe their origins to the colonialists, they were built by whites and occupied by blacks" (Balandier, 1956). Morgan's (1954) remarks about pre-colonial Ibo cities reinforces this belief: "the dispersed gardens and settlements of primitive cultivators are not concomitant with the rise of cities or the establishment of a stable administration over a large area... The arts and crafts associated with towns are simply not there in the Ibo society".

What one gathers from the above statement is that the presence of agricultural use in pre-colonial African cities disqualified them from being classified as cities from the perspective of the European. There is no doubt that definitions of what constitutes an urban area have most of the time excluded agricultural activity. Having said this, why have contemporary urban planners in Africa, who know quite well that urban agriculture was recognized as a major land use by pre-colonial indigenous planners and accommodated in their urban land use plans, failed to come to terms with such a stark reality? If planning is designed to better the lot of human kind, and if it is a dynamic activity which responds to the needs of society, then within the context of the urban informal sector (farming included) one can safely conclude that planners have failed the urban informal sector, particularly urban agriculture, by not accommodating, adopting, adapting and integrating what a significant number of urban residents have, and continue to rely on, into the urban spatial system. The need to revolutionize urban land use planning in African cities to accommodate the kind of activities which urban residents have relied on and still rely on for a living is paramount. In this regard, the reexamination of what constitutes an urban activity is appropriate. This reexamination should focus mainly on the needs of urban residents.

Having stated that one of the main goals of adopting the WRUC approach in Accra is primarily to deal with waste disposal with waste collection and disposal problems by diverting enormous quantities of organic solid waste generated, it is important at this point to assess the capacity of urban cultivation to absorb the waste that is generated. Within this context it is imperative to know the total acreage of land under cultivation, the quantities of compost per acre, the frequency and intensity of cropping and the types of crops grown. Since compost use by cultivators by farmers is minimal and since farmers do not keep records of quantities used it is extremely difficult to quantify its usage. However, the fact that the same piece of land is intensively and continuously cultivated by the urban farmer, coupled with the presence of horticulturalists, landscapers and fish framers- activities that could make use of large quantities of compost- suggests that a need market exists. Urban cultivation and related activities would be able to absorb the huge quantities of organic solid waste generated in the city in the form of compost.

A critical question which needs to be asked is, how sustainable is the WRUC approach? It must be pointed out that since the framework has not been implemented, it si extremely difficult to determine sustainability. The successful implementation of WRUC by a large number of neighbourhoods in Accra will however, lead to more sustainable outcomes because it is cheaper to operate and manage and less wasteful, helps to conserve resources, ensures urban food security and reduces poverty by generating employment opportunities.

The study sought to involve major actors in the WRUC using the transactive planning model. This involvement or participation was effected after examining the full range of activities in reusing waste in urban cultivation. Transactive techniques used included informal

discussions, conversation, demonstration projects and consultations to map out strategies. The transactive process enabled farmers, households, community leaders, urban management institutions to participate in the research process. The composting pilot project changed community's perception about waste and enhanced the community's understanding of waste disposal problems. Ensuring participation was slow and time consuming. Householders and farmers were very slow in responding to the source separation exercise. Most residents refused to participate; others agreed to participate provided there were some form of incentives. Residents in the community were poor and always preoccupied with how to feed themselves and would only participate if their efforts were going to yield some benefit. Poverty then is a major limitation to participation in poor communities in Accra.

The issue of poverty is crucial to sustainable urban development in Africa especially if the prevailing concept of urban management which emphasize strong community participation is to be effective. Elsewhere in the literature it has been shown that studies after studies in poor communities in Africa have shown that, it is not that the urban poor do not care and are not unaware of environmental problems or they do not wish to improve their situation it is simply that they are poor and overwhelmed by the need to survive.

Chapter 6

THE "HOW" QUESTION: TOWARDS AN OPERATIONAL FRAMEWORK FOR WASTE REUSE URBAN CULTIVATION

6.1 Introduction

It has been demonstrated in the preceding chapters that there is a potential for a wise exploitation of links between waste reuse and urban cultivation, and as a result there is a substantial interest in linking waste management and food production as a sustainable urban management strategy in African cities. This strategy, if implemented, could reduce waste collection and disposal problems while at the same time conserving and increasing resources and assisting low income groups in African cities. But, as the review of the literature has shown, there is no existing model or framework which could serve as a road map for urban managers in implementing the concept of waste reuse urban cultivation (WRUC). To fill in this gap, the main goal of this chapter is to synthesize ideas and issues examined in the preceding chapters to develop a framework for waste reuse in Accra and African cities in general. This framework for waste reuse urban cultivation addresses and is structured according to four core dimensions of planning: what, who, how and where.

A wide range of activities are involved in WRUC which, among other things, include the source separation of organic solid waste, storage, collection, the transportation of waste, the composting of organic solid waste, the marketing of compost, and the application of compost by farmers in urban cultivation. All these activities have to be planned and managed, and require the participation of various actors in an integrated fashion; Finally, a legal and regulatory framework as well as education to guide and promote the concept of waste reuse

urban cultivation is necessary. There are also a host of actors whose involvement is required in promoting the waste reuse urban cultivation concept. These actors include farmers, waste generators, national and municipal governments, urban management institutions, community based organizations and so on (refer to table 4.2 in chapter 4). The components of the framework are examined below.

6.2 Components of Framework

6.2.1 Education

In Accra, as in most African cities, there has been little emphasis to date on education as an urban management tool. It needs to be emphasized that public education constitutes an important component of the WRUC framework. Its importance cannot be underestimated because, as this study has revealed, many myths are harboured by urban residents with regard to promoting WRUC. A fairly significant number of urban residents think reusing waste in urban cultivation is not the right thing to do in a modern city like Accra. It was also found in the survey that knowledge, experience and familiarity about source separation and the composting of waste, which are essential components of WRUC, are lacking on the part of households, farmers and waste generators. Overcoming these critical issues requires education to debunk such myths about WRUC and to teach households, farmers, and communities about the practice of source separation and composting and to seek public participation and co-operation in promoting the WRUC concept as an urban management strategy.

Within the context of WRUC, what should be the goals and objectives of any education program, who constitutes the audience, and what education technique should be adopted and used? Any education technique should strive:

- to sensitize city officials and urban residents about the benefits to be derived from waste-based urban cultivation, collapse the myths about waste reuse urban cultivation and to demonstrate how the negative impacts of waste-based urban cultivation could be addressed and alleviated through the adoption of best management practices;**
- to develop environmental awareness among urban residents, emphasizing the negative environmental and health impacts of poor waste collection and disposal practices;**
- to teach households, communities, neighborhoods, organizations, and institutions how to source-separate compostables from non-compostables and how to compost the compostables;**
- to promote the use of compost by convincing farmers and potential users to use compost instead of chemical fertilizers.**

Having stated the objectives of a strong educational program designed to promote the concept of WRUC, the next section of the thesis examines what education techniques should be pursued to realize these objectives.

School education

The Accra district branch of the Ghana education service should take a leading role by developing a curriculum for all waste, and the negative impacts of improper waste collection and disposal practices, the benefits of waste recycling organic waste reuse. School education should be predominantly directed towards children, who constitute a large proportion of the Ghanaian population. They are the future householders and decision-

makers, and their values are easily influenced. How will the education of children impact on source separation, and compost use in urban cultivation? The argument is that children will take what they learn about environmental awareness, hygienic practices, proper disposal methods, source separation and composting into their homes. As revealed by this study, women and children are the ones who have the responsibility of disposing of household waste and attending to home gardens; hence it is appropriate to educate such important actors. The education of children in recycling, source separation, and composting is certainly an essential component of any society's effort to effect change with regard to the promotion of reusing waste in urban cultivation, but unless the school lessons are linked to home and community life in some way, their impact may be minimal.

Visits

Visits to households, markets, institutions and farmers to explain and educate actors about source separation and the composting of organic solid waste will lead to a significant achievement in promoting WRUC. Community health nurses in the city, whose work entails visiting households to educate householders on hygiene, as well, National Service personnel, could be taught how to source separate, and thereby be a part of the program to educate householders on source separation and composting. Within the various communities and neighborhoods, leaders of existing neighborhood and community groups, along with development committees, could also be taught about source separation and composting to equip them to take on the task of educating households in their neighborhoods and communities about source separation and composting their household organic waste.

Agricultural extension and development officers, who are always in the field with farmers, could also play an active role in this program.

Demonstration projects

In Accra there is a large population of people who do not attend school, and hence do not have formal education. These people will be excluded if emphasis is placed only on school education. Non-formal education efforts, in the form of demonstration projects, must be pursued to reach this audience. The community composting demonstration project clearly revealed how illiterate and formally uneducated farmers, households and community members can quickly learn techniques if they are clearly involved.

6.3 Storage and Collection

The need to separately store and collect source separated organic solid waste is paramount to implementing the WRUC strategy. Separate storage and collection avoids the problem of contamination, reducing the health risks associated with contamination and enhancing the quality of the compost produced. Separate storage of source separated household organic solid waste will require providing storage bins to householders in order that the source separated waste can be collected separately. The question is, what collection technique should be adopted on a community-wide basis to ensure efficient and effective collection of source separated waste to WRUC zones? Should permanent depots be established within the communities or neighborhoods to receive source-separated organic solid waste from households, which will be eventually transported to the composting site

within the WRUC zones? Should mobile collection teams equipped with handcarts, wheelbarrows or simple tractor trailers visit every household in the morning to collect and transport the source separated waste to WRUC zones (the "collect system")? Rather, should householders transport the source-separated waste directly to composting sites within the WRUC zones (the "bring system")? Our study (Asomani-Boateng et al., 1996) on community composting in Aglogloshie, Accra and Foo Tuan Seik's study (1997) on recycling in Singapore both revealed that the "collect system" technique is an effective method in that it increases participation rates in community recycling projects. Regarding the option of creating source separated depots within the communities, the author's concern is that in situations where the waste is not picked up, it might develop into heaps, creating health and environmental risks to the communities. The collect system technique undertaken by a collection crew is appropriate within the community/ neighborhood framework. It should be emphasized however, that the collection crew will not work without being remunerated. As the pilot project revealed, volunteers will participate fully when some incentives are made available to them.

6.4 Marketing

Marketing is an essential element in the promotion and implementation of the WRUC concept. As indicated in chapter 2 of this thesis, the absence of market promotions is a major constraint to compost use in African countries. Despite the fact that there is a huge potential market for compost in Africa, marketing has never been a part of the strategies of city or central government's efforts to promote compost use in African countries. This point is

reinforced by the finding from this study that almost all cultivators in the city of Accra were not aware of the Teshie Centralized Composting Plant, even though the main reason for establishing this plant was to provide compost to be used by the city's farmers. It is therefore important to place emphasis on market promotion, using TV, radio, newspapers and public demonstrations to promote compost use in Accra.

6.5 Land Use/Spatial Planning

As demonstrated in chapters 2 and 5 of this thesis, land is the single most important factor in the promotion of WRUC. Tenure and the availability of suitable land in suitable locations are important factors to be considered in providing the means for urban cultivation and the composting of organic solid waste. The provision of land alone is not the only consideration, since location is also an essential factor. This study has revealed that for socio-economic reasons, farmers in the city tend to farm in areas which are close to their homes and where water is available. Furthermore, the composting pilot project revealed that the close proximity of composting sites to the communities using them enhances participation in household source separation and community composting projects. Chapter 2 also indicated that successful community composting projects are those that are located close to users of compost. Close proximity of composting plants to users reduces transportation costs which is one of the major constraints to compost use in developing countries, because compost is bulky and thus costly to transport over long distances.

Equally important is what is available or provided at farming locations. The survey revealed that farmers in the city tend to farm near streams and drains in order to obtain a

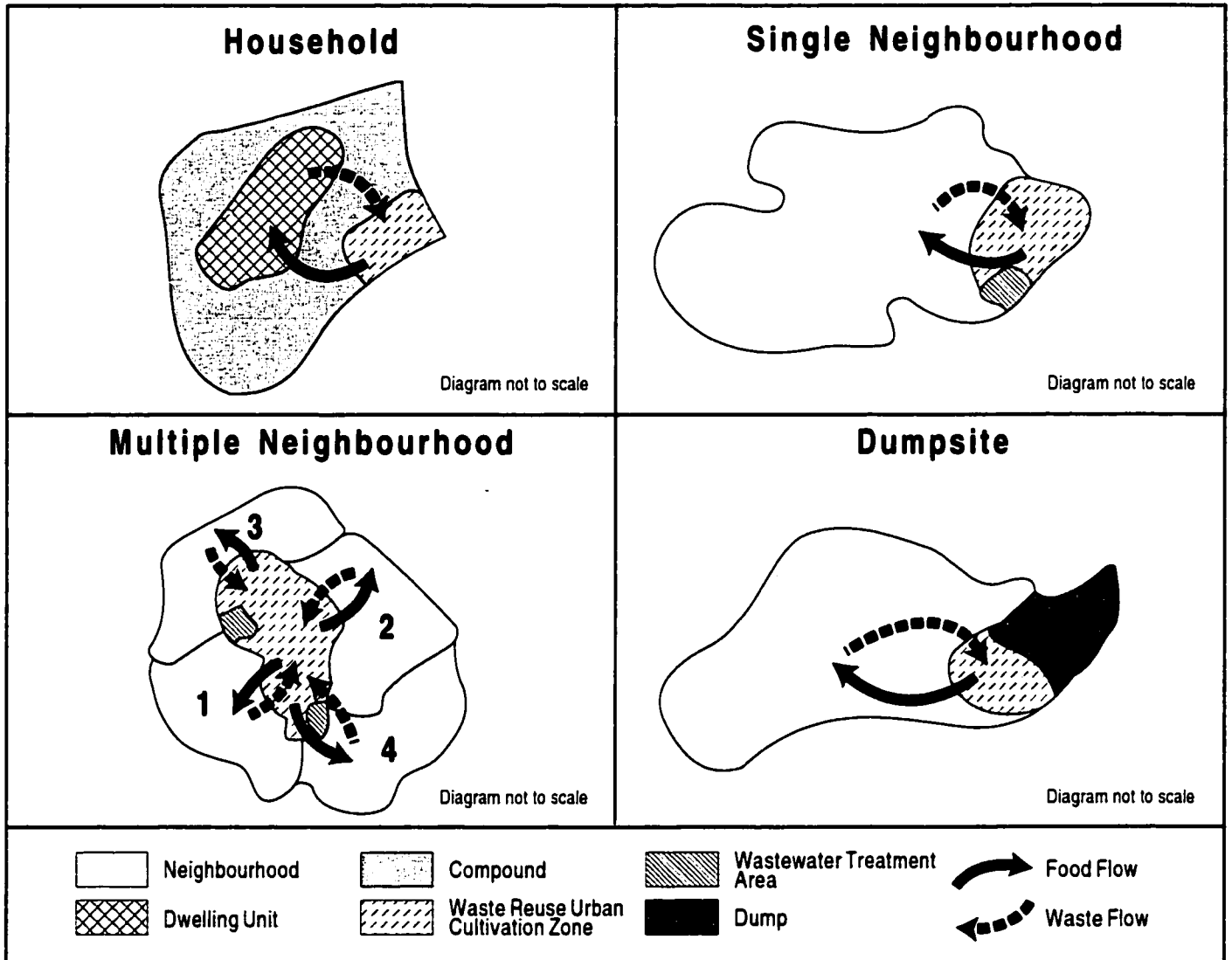
continuous supply of water for irrigating their crops. In this regard, designating sites for urban cultivation and organic solid waste recycling should focus not only on the site per se but also what is available at the site. Spatial and land use plans which integrate residential communities with farming areas in a coherent and efficient physical form are required. To facilitate the promotion of the WRUC concept, it is proposed that WRUC zones be created within the city and peri-urban areas of the city. The vision of the WRUC is based on what I term "ecological waste management and resource conservation" which draws on three fundamental principles:

- (i) rendering organic solid waste safe;**
- (ii) preventing pollution rather than remediating it after it has occurred;**
- (iii) using the safe product resulting from the composting of organic solid waste for agricultural purposes.**

The WRUC approach is a cycle-- a sustainable, closed-loop system. This approach is resource- minded and treats and views organic solid waste as resource. Source- separated organic solid waste from homes and institutions is composted in the WRUC zones until it is free of pathogens, and the resulting compost is then recycled into cultivation which takes place within the same zone.

It is important to designate these zones near residential subdivisions and markets where, as revealed in chapters 1 and 2, significant quantities of organic solid waste are generated. These zones should serve as both composting and farming sites where source separated organic waste from residential areas and markets is composted by farmers for use on their farms. Various models or scenarios have been developed to respond to differences and variations within African cities.

Figure 6.1: Waste Reuse Urban Cultivation Models



These are household, single neighborhood, multiple neighborhood and dump site models (Fig 6.1). Within and around homes and households with enough space, especially in medium and high class sectors of African cities, portions of these spaces could be designated as WRUC zones. Within single and isolated neighborhoods with space within and adjoining the neighborhood, such spaces could be used as WRUC areas, while in the case of neighborhoods clustered together and separated by a common open space, a portion of this space could be used for the composting of organic solid waste and for cultivation. In high- density residential areas in which the dump site is the only area with enough space, a portion of the dump site could be used as a WRUC zone. In existing built up areas, portions of existing permanent open spaces could be designated as WRUC zones. Wastewater from residential areas could be channeled to these zones and treated using cheap, simple and effective treatment techniques, and ultimately used in irrigating crops and in composting operations.

6.6 Implementation

The WRUC concept requires organization, planning, management and funding and some sort of institutional arrangement to implement the concept. Institutional aspects of WRUC include institutional structures and arrangements as well as organizational procedures and the capacity of these institutions to operate efficiently and effectively. This brings into play jurisdictional issues: which level of government is in the best position to operate and implement the waste reuse urban cultivation concept?

6.7 Organization

In order to operationalize the WRUC concept, one level of government needs to take responsibility for implementing and overseeing the concept. The Accra Metropolitan area or Accra district is comprised of six sub districts, as indicated in chapter 1. With the implementation of the national government's decentralization policy, which is designed to increase and ensure citizen's participation in the decision making process and consequent activities which affect them, the city's waste management functions and responsibilities have been decentralized to the districts. To fit within the existing institutional arrangement, the waste reuse strategy should be operationalized at the sub- district level, focusing on residential neighborhoods and communities. Operationalizing the concept at the local level is essential as it has been demonstrated in the thesis that farmers in the city are scattered, and centralizing composting operations within such a context is inappropriate. Studies have shown that centralized composting operations tend to be far removed from farmers, increasing the cost of compost and ultimately making compost use unattractive. Viewed from such perspective, it is imperative to decentralize composting operations, which can be achieved by operationalizing the WRUC concept at the district level. At the community/ district level the participation of various actors is essential, and it has been demonstrated in chapter 3 that the key concepts of urban management, sustainable urban development, and the integrated approach, which form the basis of this study, emphasize the importance of participation. Participation could be achieved through the mechanism of transactive planning. The transactive mechanism will create opportunities for a mutual learning process whereby the practical knowledge of the farmer, community member, and householder will be synthesized

with the technical knowledge of the city planner, the waste management expert, the agricultural extension officer and others to identify problems, formulate goals and initiate action to achieve objectives relating to the implementation of the WRUC concept. In each of the six sub-districts which make up Accra, the metropolitan department of food, together with the district waste management units, community organizations, and farmer's associations would initiate action to implement the WRUC concept. The organizational framework as outlined thus far is not meant to exclude the participation of the Accra Metropolitan Authority, the sole agency responsible for the overall management of Accra. In light of the above discussions the AMA's role within the organizational framework must be clearly defined. While directly not involved in the day- to- day implementation of the WRUC strategy at the sub district/community, the AMA must:

- promote the WRUC concept through education designed to increase public knowledge about and build support for the WRUC concept;
- provide funds for implementing the various aspects of the WRUC concept including source separation, separate storage and collection of source separated waste, composting and marketing of compost;
- revise municipal or establish municipal by- laws or land use regulations to permit the zoning of land in the Accra Metropolitan Area for waste reuse urban cultivation

6.8 Funding

To implement the Waste Reuse Urban Cultivation program described, funds must be available. As the pilot project revealed, incentives in the form of money, clothing, and food are needed to encourage community /neighborhood residents and householders to source-separate organic, transport and compost source separated organic solid waste. Simple tools

and equipment like shovels, rakes, wheelbarrows, handcarts, storage bins, and protective garments are needed for source separation and composting operations. Funding should be available to provide these items.

The Accra Metropolitan Authority (AMA) should allocate funds for implementing the WRUC concept. A WRUC fund should be established by each of the six sub-districts to generate funds for educational programs, source separation and composting operations. Monies for this program should be provided by major generators of organic solid waste, such as restaurants, hotels and markets, and industries like Accra Brewery and Valco, environmentally conscious organizations like Green Earth, Cencosad, NGOs and the general public at large should also be approached to contribute to this fund. Compost produced should be sold and monies realized used to fund this program.

6.9 Summary

This chapter has established that a Waste Reuse Urban Cultivation Framework consists of :

- (1) A public education component, including
 - (i) School education
 - (ii) Home visits
 - (iii) Demonstration projects/programs
- (2) Viable storage, collection and transportation of source separated organic solid waste;
- (3) Using various communication channels to market compost;
- (4) Creating Waste Reuse Urban Cultivation zones in the city for urban farming and composting of organic solid waste;

- (5) Implementing the framework at the Sub-district level, focusing on residential communities and neighborhoods;**
- (6) Funding for the implementation of the framework should come from the AMA.**

The combination of the above points offers a good chance of successful implementation of the Waste Reuse Urban Cultivation concept. It must be emphasized that the true test of the framework will only be achieved when adopted by the six sub- districts of Accra Metropolitan Area.

Chapter 7

SUMMARY AND RECOMMENDATIONS

7.1 Introduction

Waste Reuse Urban Cultivation is strongly being promoted by international organizations as an urban management strategy for African countries and the developing world in general, because reuse will provide nutrients and organic matter for soil conditioning, improve the environment by eliminating or reducing municipal waste that piles up in African cities, conserve resources and improve food security and assist low-income groups in Africa's urban areas. Despite these benefits , research into this area is lacking. The main task of this research was to undertake study of municipal solid waste management and urban cultivation in Accra, Ghana and, based on the findings, to develop a framework for linking urban cultivation and municipal solid waste management through organic solid waste recycling or composting. The specific objectives of this study as stated in chapter 1 were to:

- (i) examine the nature, extent, components and the status of urban cultivation in Accra and identify how organic solid waste from the city's municipal solid waste stream is currently being utilized;**
- (ii) study the environmental, economic, social, institutional and cultural opportunities and constraints for organic solid waste reuse in urban cultivation in Accra;**
- (iii) identify areas in the city which are currently being farmed or which would be suitable for both food cultivation and on site composting of organic solid waste;**
- (iv) develop an operational framework for WRUC, which links organic solid waste recycling and urban food cultivation, in Accra, and which might be applicable to other Ghanaian cities as well as other Sub-Saharan African cities faced with solid waste collection and disposal problems.**

These objectives have been achieved in relation to the WRUC in Accra, Ghana. The objectives were addressed over course of this study using a number of research techniques, mostly qualitative techniques including literature reviews, demonstration projects, informal discussions, conversations, observations, non-scheduled interviews, and questionnaires. In this concluding chapter, attention is drawn to policy guidelines for waste reuse urban cultivation and avenues for future research.

7.2 Significance of Research

International organizations, experts and researchers on urban environments, and municipal governments in African cities have emphasized and stressed the need to integrate MSWM and UA in African cities but studies in this area are lacking. Several studies have been undertaken on urban agriculture and municipal solid waste management but none has explored how MSWM and UA could be integrated. This study is the first of its kind and will serve as the basis upon which further research will evolve. Since most municipalities in Africa's urban areas are determined to integrate MSWM and UA but are constrained in their approach, the operational framework which has been developed as a result of this study will serve as a model for integrating MSWM and UA.

7.3 Policy Recommendations

Considering that WRUC is now the most promoted urban management concept in Accra and other African cities, it is suggested that the following specific recommendations be implemented.

7.3.1 Promotion of the use of organic manure and compost.

As this study has revealed, a significant number of farmers in the city are already using organic manure (cow dung and poultry droppings) for reconditioning the soil. The Ministry of Food and Agriculture and the Metropolitan Department of Food and Agriculture, in collaboration with the AMA, WMD and environmental NGOs like Cencosad and Green Earth, should embark on a massive promotion of the use of compost and other organic manures through marketing and educational programs designed to sensitize farmers and urban residents to the advantages of using compost and other organic manures. Hence, a policy on reuse and organic solid waste recycling should be enacted by the AMA. Efforts should be intensified to promote source separation of organic solid waste and its recycling or composting as input into urban agriculture.

7.3.2 Increased support for waste-based urban cultivation

Increased support for urban residents engaged in farming in the city of Accra is needed in the form of providing extension service, access to improved indigenous technology for intensified production systems, and access to credit. This support should be channeled through existing farmers' associations. Extension services should focus on educating farmers on critical issues relating to waste based urban cultivation: the use of compost and other organic manures in cultivation, the safe use of agro-chemicals, and intensified farming practices to increase yields per unit of land while protecting the environment.

7.3.3 Introduction of new/revision of old municipal By-laws

By-laws which seek to promote reuse of organic wastes in urban cultivation should be passed by the AMA and existing by-laws on waste water reuse should be revised in the light of findings by Amar-Klemesu et. al., (1998) that while food contamination is a serious concern, the major sources of contamination appear to be in the marketing, handling and distribution system, not in the production system. Hence any intervention to prevent the spread of gastro-intestinal infection should take the form of better education about food hygiene at the household level and ensuring cleanliness in the city's market and distribution points. Equally important is the need to treat the city's waste water before it is used in irrigating crops.

7.3.4 Incorporating WRUC zones into urban land use planning

The rapid rate of urbanization along with the conversion of agricultural land into residential and commercial uses, and the adverse impacts on the livelihoods of urban farmers of the city, calls into question the efficacy of land use planning in the Accra Metropolitan Area. It is obvious that land use planning and development control have been ineffective since development is ahead of planning in the city. Under such conditions it becomes extremely difficult to protect agricultural land use. Larbi (1996) estimated that roughly 2,100 hectares of land per year are being converted from agricultural to other urban land uses. Between 1993 and 1997, this estimate shot up to over 2,600 hectares per year. Added to the problem of land conversion is the fact that contemporary planning in Accra, as in any African city which has its origin in colonial urban planning, does not make room for agricultural use since

it is considered a rural activity, in spite of the fact that agricultural land use has been a major component of pre colonial urban land use planning. Urban agriculture nevertheless has been found in this and other studies (Cencosad, 1996; Maxwell and Amar-Klemesu, 1998) to have potential benefits both in terms of diet and income supplement for urban residents even under severe limitations of space.

It is recommended that, in designing land use plans, land should be reserved for farming and the composting of organic solid waste. These zones should be under community control and farmers should be given the usufruct to use the land within these zones for farming. Land use and zoning regulations should be in place and effectively enforced to protect these zones from encroachment by other uses. Communities which have the responsibility of managing these zones should fully participate in any process designed to enact rules and regulations to protect these zones. In designing urban housing especially for low income housing, adequate space should be provided around and within homes for composting of household organic solid waste and for gardening.

7.3.5 Marketing

It was found in this study that the inadequate marketing of farm produce is a major problem facing farmers in the city, and this problem stems from the under- pricing of produce by traders who deny farmers their fair prices for their produce. It is recommended that a policy on direct marketing be established, whereby farmers are allocated stalls in the major markets of the city to enable them to sell their farm produce directly to the consumers in order to earn more money from their produce. There is also the need to promote the use of

compost by emphasizing the benefits for urban cultivation, the environment and municipal solid waste management. Creating awareness is important in generating interest in compost use. It is suggested that the vigorous advertising and demonstration campaigns pursued in the 60s to promote the use of agro-chemicals under the "green revolution" program should be adopted to promote compost use in farming in Accra and other African countries.

7.4 Issues Arising for Research

Major themes arise from the review of literature on urban agriculture and organic solid waste reuse and recycling. The first issue relates to land, which is a major input but also a limiting factor in WRUC. It is important to ascertain how land use zoning systems can accommodate WRUC. The question is whether to provide land within and around homes for WRUC or set aside land adjacent to residential zones. Even though this study examined this issue and provides some preliminary answers, more studies within different contexts are required.

Very little is known about the actual production levels of urban cultivation in Accra. Ascertaining production levels within the context of the urban food production system is imperative. These data are required to inform the public about the role of this activity in the urban economy. Particular attention may have to be paid to issues relating to the extension and credit needs of urban farmers.

In view of the paucity of studies on urban management and its impact on waste-based urban farming, more work needs to be done in these areas. Particular attention may have to be paid to legislation that is inimical to WRUC with a view to reconciling this legislation with

waste-based urban agricultural practices when it is amended. It is also necessary to consider enabling legislation that will be required to provide support for waste reuse urban farming practices in urban areas.

Fewer studies have attempted to look at the ecological or environmental effects of waste reuse urban cultivation. The ecological impact of WRUC needs to be explored, particularly its impact on water quality and general land degradation. This is important because it addresses the sustainability of WRUC over time. Equally important are the health impacts resulting from reusing organic solid waste in urban cultivation. There are three main categories of people at risk: those who have direct contact with raw or treated wastes; those living near compost operations, garbage farms and sewage-fed fish ponds; and the general public, who are affected through food chain links and water contamination. Research into these areas is critical, because few studies on health risks allow for the adoption of suitable preventative measures and monitoring and thereby make waste reuse practices acceptable.

An urban agriculture market study is required to establish existing output. Particular attention needs to be paid to the market decision environment, competition, and possible accessibility to official marketing channels through quasi state bodies.

7.5 Concluding Remarks

The practice of reusing waste, as shown in this thesis, is not new to African countries. Urban and rural communities have long traditions of resource conservation through waste reuse and organic waste recycling in agriculture and aquaculture, and there is a great diversity of waste reuse practices existing in African countries. Promoting this age old practice requires

revolutionizing urban land use planning in African cities to accommodate spaces for farming and the composting of organic solid waste. Conflict between agriculture and other urban uses will continue to occur due to the fact that, historically, African cities were located on sites which were prime farm lands, so that they could be supported nutritionally from within their immediate surroundings. It is thus not entirely a coincidence that conflicts are common between agriculture and the expansion of built areas. Planners in African cities should recognize the fact that agriculture is as much an urban land use as industry, housing and commerce, and should therefore prepare land use plans and regulations which accommodate agriculture. Within this context the concept of urban has to be revisited and a new definition which accommodates the African reality is required.

At the city level, city authorities should create an enabling environment for WRUC by modifying health and land use regulations and creating the institutional structures to promote waste reuse urban cultivation.

A significant portion of foreign aid being channeled to African countries to address urban waste and sanitation problems should be used to promote and support community-based waste reuse urban cultivation. With increasing numbers of urban residents taking to urban cultivation, and given that the organic fraction of waste accounts for the greatest percentage of the total municipal waste stream, which is not likely to change drastically in the next two decades or more.

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PERSONAL COMMUNICATIONS

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Tetteh, D. Accra Sustainable Project. Town and County Department, Accra, Ghana, December, 1997.

APPENDIX A: Research Questions

Household, Vacant Space and Peri-Urban Cultivators

Socio-Economic & Demographic Characteristics

1. **Sex of cultivator**
 - (a) Male
 - (b) Female

2. **Marital status**
 - (a) single
 - (b) married
 - (c) divorced
 - (c) widow

3. **Household size**

4. **Ethnic Background**

5. **Level of education**
 - (a) No formal education
 - (b) Elementary
 - (c) Secondary
 - (d) Tertiary/Post secondary
 - (e) Other (specify).....

6. **Age of cultivator in years**
 - (a) 15-30
 - (b) 31-45
 - (c) 46-60
 - (d) 61-75
 - (e) 75+

7. **Profession/Occupation**

8. **Which part of the city do you live?**.....

Farming Practices

9. **Do you own the plot on which you cultivate?**
 - (a) Yes
 - (b) No

10. Who owns it
11. Do you have to pay money to use this land?
(a) Yes
(b) No
12. How much per month or year?
13. How long have you been cultivating crops in the city?
14. Why do you engage in crop cultivation in the city?.....
15. What do you grow on your plot?.....
16. Why do you grow these particular crops?.....
17. Is crop cultivation your full/part time job?.....
18. If part time what is your full time job?
19. Do you cultivate throughout the year?
(a) Yes
(b) No..... Why?
20. Do you intend to quit urban cultivation?
(a) Yes..... Why?
(b) No..... Why?

Farming Inputs

21. Do you use any fertilizer on your farm?
(a) Yes
(b) No..... Why?
22. If "Yes" what kind of fertilizer do you use?.....
23. Do you have to spend money to get the fertilizer?
(a) Yes
(b) No
24. If "Yes" how much money do you spend on fertilizers in a month or year?

25. **What problems do you face in acquiring fertilizers to use on your farm?.....**
26. **Are you aware that manure, organic household and market refuse can be used as fertilizing material on your farm?**
 (a) Yes
 (b) No
27. **Do you use or have you used any organic waste on your farm?**
 (a) Yes
 (b) No..... Why?
28. **If "Yes" what kind of organic waste?.....**
29. **In what form do you use it?**
 (a) raw
 (b) treated
30. **Do you use compost on your farm?**
 (a) Yes
 (b) No. Why?
31. **Have you composted before?**
 (a) Yes
 (b) No
32. **Are you aware of the existence of the Teshie Nungua composting plant?**
 (a) Yes
 (b) No
33. **If "Yes" how did you get to know the plant?**
 (a) Radio
 (b) Newspapers
 (c) Agricultural extension officer
 (d) Fellow farmers
 (e) Other, specify
34. **Where do you obtain your compost?**
 (a) Compost yourself
 (b) Teshie Plant
 (c) Abandoned waste dump
 (d) Other (specify):

35. Do you buy your compost (black soil)?
 (a) Yes
 (b) No
36. How much do you spend on compost in a month/year.....
37. What problems do you encounter in getting compost to use on your farm?
38. Will you prefer to use compost on your farm instead of fertilizers?
 (a) Yes..... Why?
 (b) No..... Why?
39. How much do you have to spend in a month/year on the following? Answer where applicable
 (a) Seeds
 (b) Water
 (c) Fertilizer
 (d) Land rent
 (e) Labor
 (f) Compost
 (g) Manure
 (h) Other (specify)

Farming Output

40. Do you usually sell the crops you grow or eat them?
 (a) Use for home consumption only
 (b) Sale
 (d) Partly used for home consumption and partly sold
41. Approximately how much do you think your family saves in a year by eating self-grown crops?.....
42. Is the self grown crops sufficient for your family or do you still need to buy some more from the market?
 (a) Sufficient
 (b) Need extra
43. How much do you spend in a month/year buying food crops from the market?.....
44. How much do you usually earn in a month/year by selling produce from your farm?.....

- 45. If the Accra Metropolitan Authority allocates land in the city for both farming and compost production, will you work with other farmers in cultivating the land and in composting organic solid waste to be used on your farms?.**
- (a) Yes**
 - (b) No..... Why?**

- 46. What problems do you face in cultivating in the city?.....**

Appendix B: Research Questions

Urban management institutions, major waste generators, users of recycled organic solid, political institutions

Environmental Issues

1. Do you think Accra is experiencing serious environmental problems?
 - (a) Yes
 - (b) No

2. If "Yes" give four (4) specific examples.....

3. Do you think the city's waste management system has been effective in addressing waste collection and disposal problems in the city?
 - (a) Yes
 - (b) No

4. What are the waste management problems in the city?

5. How much of a problem is garbage to Accra in general?
 - (a) No problem
 - (b) Somewhat of a problem
 - (c) Serious problem
 - (d) Only in certain areas

6. Which areas in the city have problems? List the main areas.

7. Specifically what do you think are the effects of poor refuse collection and disposal?
 - (a) Spread disease
 - (b) Bad smells
 - (c) Increase rats, mosquitoes, flies and cockroaches
 - (d) Gets in the way of recreation, walking, work etc.
 - (e) Other (specify).....

8. Do you think the city's organic solid waste is a resource which can be exploited?
 - (a) Yes
 - (b) No

9. How do you see people who handle waste in the city?
 - (a) Diseased
 - (b) Untidy
 - (c) Thieves

- (d) Poor
- (e) Other (specify).....

Urban Cultivation

- 10. **Do you think allowing people to cultivate in the city is the right thing to do?.....**
 - (a) Yes Why.....
 - (b) No Why.....
- 11. **What do you think are the problems associated with urban food cultivation in the city?.**
- 12. **Is your institution prepared to promote urban food cultivation in the city?**
 - (a) Yes
 - (b) No Why?
- 13. **If "Yes" what sort of things can your institution/organization do to promote food cultivation in the city?**

Organic Waste Recycling

- 14. **Are you aware that animal manure, household organic and market waste can be treated and used as soil conditioner in urban cultivation?**
 - (a) Yes
 - (b) No
- 15. **Composting the city's organic solid waste which forms about 80% of the municipal waste stream and using the compost in urban food cultivation would significantly reduce the city's waste collection and disposal problems. Is your organization/institution willing to promote reusing waste in urban cultivation?**
 - (a) Yes
 - (b) No Why?
- 16. **If "Yes" in what ways can your institution help promote this concept.**
- 17. **Waste reuse urban cultivation involves source separation and composting of source separated waste. the rational is people separate their wastes into wet organic material and dry recyclables, it will be easier to manage waste because the organic fraction can be safely composted. If source separation and composting are to be initiated at the household and neighborhood level. is your institution willing to promote these activities?.**
 - (a) Yes
 - (b) No Why?

18. **If "Yes" how can your institution help in source separation and composting of the ss waste?**
19. **Which of these do you prefer and why?**
(a) Food grown with artificial fertilizers
(b) Waste grown food
20. **Will you tolerate the reuse of waste in urban food cultivation in the city?**
(a) Yes Why
(b) No Why
21. **Do you think it is appropriate to use organic waste in food cultivation in the city?**
(a) Yes Why
(b) No
22. **Are you willing to consume food grown with organic wastes, nightsoil and wastewater?**
(a) Yes
(b) No Why
23. **Does your institution/organization have programs or policies to promote reuse of waste in urban food cultivation in the city?**
(a) Yes Specify policies and programs
(b) No Why
24. **What do you think are the barriers to waste reuse cultivation in the city. Describe these barriers.**
25. **Please use the space below to identify innovations that you think might enhance reuse of waste in urban food cultivation?**

APPENDIX C: Logistic problems hamper refuse collection in Accra

Logistic problems hamper refuse collection

. . . In Accra

By Siisi Quinoo

THE Wastes Management Department of the Accra Metropolitan Authority is currently capable of disposing about 100,000 cu metres of refuse generated within the metropolis monthly due to the breakdown of 18 out of its 27 refuse trucks.

Consequently, it is estimated that within the next five months there would be a refuse pile-up of 1,000,000 cubic metres.

This was made known yesterday by Mr Ben Laryea, Assistant Chief

Environmental Officer of the Wastes Management Department and Mr Harry R. Kramer, Senior Waste Management Adviser also of the department when they briefed three ministers about the waste disposal situation in the metropolis in general and Tenkwa in particular.

The ministers are Dr (Mrs) Christian Amaha-Nuamah, Environment, Science and Technology, Mr Kwame Aboah, Local Government and Housing Department and Mr Mike Giza, Greater Accra Region.

Mr Laryea and Mr Kramer pointed out that the remaining nine vehicles break down very often due to over-utilisation and this at certain times compound the problem on

land. They said currently there are 200 containers sites all over the metropolis but most of the sites are now without containers.

Enumerating the problems facing the department, they said the department is able to generate only 250 million against its expenditure of 600 million.

According to them, the German Government has

given Ghana a grant of DM 5 million for the procurement of seven trucks and spare parts to help alleviate the problem.

The trucks and spare parts would however arrive in the country in late August and September and explained that the coming of the new trucks would not solve the problem as a result of the growing population in the metropolis.

On the situation of the Tenkwa compost plant, the

two officials said the cost had around the plant is marked by further expansion to being completed soon.

Mr Aboah asked officials of the Wastes Management Department to make the utilization more of the compost problems.

He said if the problems had been made known earlier something would have been done about it by now.



• Dr (Mrs) Amaha Nuamah (middle) inspecting the plant. With her include, Mr Mike Giza (2nd left), Mr Kwame Aboah (right front) and some officials from the Wastes Management Department

SANITARY

**Bye-laws under Native
Jurisdiction Ordinance**

No. 5 of 1883.

GOLD COAST :

Government Press, Victoria, Australia

1911

AMA: WE CAN'T COPE WITH ACCRA'S REFUSE

By Peter Korda



© A heap of refuse at Akweteman.

RESIDENTS of the Accra metropolis may have to learn to live with refuse for some time.

This follows the disclosure in Accra yesterday by a source at the Waste Management Department of the Accra Metropolitan Assembly (AMA), that the present tonnage of refuse generated everyday was far beyond the management of the Department.

The source was reacting to a 'Times' story of April 9 with the headline, 'Refuse Engulf's Akweteman'.

The source cited the lack of equipment and other logistic problems, among others, as having a serious crippling effect on the operations of the department.

It said some of the few vehicles left in the department's yard had no tyres and other basic parts, adding "this has compounded our already bad situation and has placed us in a position where almost every dweller in the city thinks we are inefficient".

The source however said, the few vehicles the department had which were roadworthy, were being effectively utilised to help solve some of the problems of refuse collection in the city.

The source hinted that the AMA was expecting the German Government assistance this year, in the form of refuse containers, trucks and pay loaders "to help us solve the problem".

The source called for a systematic and sustained programme to check the problem of refuse collection in the metropolis.

'Indiscriminate disposal of waste, cause of insanitary conditions'

From Laual Merin, Kumasi

IMPROPER Planning or lack of planning, ignorance and the habit of indiscriminate disposal of waste in the society have caused insanitary conditions in urban and rural areas.

Professor P. A. K. Addy, head of the Department of Clinical Microbiology of the School of Medical Sciences (SMS) of the UST has said.

Professor Addy was speaking on 'The role of the youth in the maintenance of a clean

environment' at a symposium organised by the Kumasi Polytechnic Students Dispensing Technicians Association (STUDTAG) as part of their annual Health Week celebration in Kumasi.

He noted that the accumulation of human waste arising from indiscriminate disposal of used water refuse among others created an unhealthy environment unfit for human habitation.

Professor Addy called on Ghanaians to intensify the education campaign for a clean environment adding "We possess the capacity to change and keep the environment clean."

Dr (Mrs) Charlotte Ababak, a dentist who spoke on 'Oral Health', stressed on the need for regular check-up with dentists for early and quick detection of most diseases which affected the people.

She said such diseases as diabetes, malaria, tuberculosis and diphtheria manifested themselves from the mouth and regular check-up could have them detected early and the necessary precautions taken.

Dr Ababak said, adults could have oral check-up twice a year while children developing permanent teeth could have it three times a year.

Sanitary Bye-laws under Native Jurisdiction
Ordinance No. 5 of 1883.

1. The Chief or headman shall select sites in the vicinity of his village for latrines and rubbish heaps which sites shall not be less than 100 yards from any house or water supply: he shall cause the ground in the vicinity of the latrines to be kept clean and in good order.

2. Any person using any other site than that appointed by the Chief or headman shall be guilty of committing a nuisance and be liable to a fine not exceeding 2/6.

3. Any inhabitant of a village who wilfully disobeys the order of a Chief or headman with regard to

- (1) cleaning the vicinity of his house;
- (2) filling up or mused water holes and borrow pits;
- (3) clearing paths;
- (4) digging latrines; and
- (5) demolishing any ruined house of which he is the owner when the order of the Chief is supported by the written certificate of a District Commissioner, Medical Officer or Foreman of Works shall be liable to a fine not exceeding 10/-.

(24)

4. The Chief or headman shall select a site for a cemetery, which site shall not be less than 100 yards from any house or water supply and fence it in. All dead bodies shall be interred in this cemetery. Any person burying a body outside the cemetery shall be liable to a fine not exceeding 20/-

5. The Chief or headman shall at once report to the District Commissioner the occurrence of any infectious disease in his town or village.

6. The occupier of any house where a case of infectious disease shall occur or be suspected to have occurred shall report the matter at once to the Chief or headman. Any occupier who so fails to report shall be liable to a fine not exceeding 20/-

7. Every inhabitant of a town or village concerned shall be responsible to the Chief or headman of such town or village in carrying out all measures ordered by the District Commissioner or Medical Officer for the prevention of or against the spread of infectious diseases, such orders may be in respect of:—

- (1) isolation of patients;
- (2) construction of isolation huts;
- (3) disinfection of houses;
- (4) evacuation of houses;
- (5) evacuation of town areas.

Any person failing to comply with any such order shall be liable to a fine not exceeding

8. No person shall erect any building in any town or village without the permit of the Chief or headman. It shall be the duty of the Chief or headman in issuing these permits to see that

- (1) a space of not less than 12 clear feet will intervene between the building which is to be constructed and the nearest adjacent building;
- (2) the distance between the back or front of any building from the back or front of any building opposite to it shall not be less than 30 feet;
- (3) the building will not block or abut upon any roadway, but will be in line with other buildings;
- (4) due provision has been made for

Any person building a house without a permit may be served with an order to pull down the same and if such person fails to comply within 7 days the Chief or headman may have the house pulled down and may recover from the owner the expenses incurred in demolishing such house.

9. The Chief or headman of every town or village where pigs or cattle are kept shall have kraals or pens erected outside the town or village wherein such pigs and cattle may be penned. It shall be unlawful for any inhabitant of a town or village to keep pigs or cattle within 50 yards of any occupied house in such town or village.

10. The owner of any horse, mule, donkey, cattle, swine, sheep, goat, cat, dog, or other domestic animal suffering from, or suspected to be suffering from, any infectious disease shall at once destroy the same or report the matter to the Chief or headman. Any person not so destroying or reporting shall be liable to a fine not exceeding 2/-. The Chief or headman shall at once report the matter to the District Commissioner or Medical Officer who may order the animal to be destroyed.

11. The Chief or headman shall select where necessary sites for wells or water holes and see that they are sufficiently far from the town or village and that the ground around them is kept clean and the well protected from surface water.

12. Any person fouling any well or watercourse used for drinking purposes shall be liable to a fine not exceeding 2/.

Approved

Maucha Abim Abim

Maucha's Sileh Nari

Capt. Agbeshie

Noah Quarumye

Linguist Tetteh Kuteh

Maest. Benardoo Nukura

Linguist Fietti Kwao

Witness to mar. 20

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1. 2. 1912

**ACCRA METROPOLITAN ASSEMBLY
(SOLID WASTE MANAGEMENT) BYE-LAWS 1991**

In exercise of the powers conferred upon the Accra Metropolitan Assembly by Section 51 (1) of the Local Government Law 1988 (PNDC 207) the following bye-laws are hereby made this day of 30th May 1991

- | | |
|---------------------------------|---|
| Title | 1. These Bye-Laws may be cited as the Accra Metropolitan Assembly (Solid Waste Management) Bye-Laws 1991. |
| Delivery of Services | 2. The Waste Management Department of the Accra Metropolitan Assembly or its registered authorised agents or contractors shall be solely responsible for solid waste management within the metropolis. |
| | 3. Every household, industry, office and other premises shall make their solid waste available to the Waste Management Department or its authorised agents or contractors. |
| Disposal | 4. Solid waste made available by owners or occupiers of premises shall be collected treated and disposed of at designated sites by the Waste Management Department. |
| Waste Management Officer | 5. All occupiers or owners of premises apart from household premises shall designate a member of their staff to be responsible for matters on waste management and liaise with the Waste Management Department. |
| Waste Container | 6. Waste containers are to be provided for the storage of waste by the owner or occupier of premises in accordance with the "standard" approved by the Accra Metropolitan Assembly. |

APPENDIX F : Accra Metropolitan Assembly (Solid Waste Management) By-laws 1991

- 2 -

Fee

7. Prescribed fees shall be levied on the owner or occupier of premises by the Accra Metropolitan Assembly.

Offences

8. The following shall constitute offences and the offenders shall be liable to penalties as provided for in S.9 of this law:-

(a) indiscriminate dumping of solid waste in open spaces, drains, gutters and other unauthorised places;

(b) Failure to provide standard waste containers;

(c) Refusal to allow the Accra Metropolitan Assembly and its agents or contractors to collect solid waste from one's premises;

~~(d)~~ Failure to pay for services rendered by the Accra Metropolitan Assembly, its agents, or contractors, for three months consecutively.

Penalty S.

9. Where a person commits any of the offences stated in S.8 (a) (b) (c) and (d) of this By-Law, he shall be liable to a fine not exceeding ₵50,000.00 or a term of imprisonment not exceeding six months in default of payment

Interpretation:

In this Law unless the context otherwise requires:-

"Person" means both legal and natural

"Solid Waste" shall mean refuse and rubbish

"Standard" means shape and size.

**ACCRA METROPOLITAN ASSEMBLY
WASTE MANAGEMENT DEPARTMENT**

**PUBLIC NOTICE
REFUSE AND NIGHTSOIL FEES:**

The Waste Management Department of the Accra Metropolitan Assembly wishes to inform the general public that the refuse and nightsoil fees from January 1993 are as follows:

1. CESSPIT AND NIGHTSOIL SERVICES

Cesspit Desludging Private	18,000
High Pressure Cleansing	30,000
Cesspit Desludging Commercial	25,000
Desludging Public Toilets	12,000
Discharge of Effluent (other organisations)	5,000
Pan Latrine Service (Charge to User) per pan monthly	2,400

2. Solid Waste Services (per month)

HOUSE TO HOUSE COLLECTION:

2.1. Service Charge

Non standardized Container	3,200
120 litre Container	3,000
240 litre Container	4,000
1100 litre Container	12,000

2.2. HIRING SERVICES

Container 120 litres:	
Deposit	9,000
Service/Hiring charge	4,500

Container 240 litres:	
Deposit	15,000
Service/Hiring charge	6,000

Container 1100 litres:	
Deposit	60,000
Service/Hiring charge	35,000
3200 litre Container	60,000
7000 litre Container	70,000
10000 litre Container	80,000
Special Container Service	30,000

3. Refuse Levy (central container service) p.a.	8,500
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4. DUMPING FEES (LANDFILL SITES)

Pick-ups	1,000
Trucks	2,000

5. COMPOST

Ex-yard delivery (m ³)	1,500
6 m 3	19,000
10 m 3	25,000

**ISSUED BY THE PUBLICITY SECTION
WASTE MANAGEMENT DEPARTMENT**