

**Livestock Production in Peri-Urban Areas of Africa:
An Analysis of Dar es Salaam, Mwanza and Shinyanga, Tanzania**

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	
LIST OF TABLES	ii
LIST OF FIGURES.....	iii
LIST OF MAPS	iii
LIST OF ACRONYMS AND ABBREVIATIONS	iv
ACKNOWLEDGEMENTS	v
SUMMARY	
INTRODUCTION	
BACKGROUND AND CONTEXT	2
THEORETICAL PERSPECTIVES AND RELEVANT LITERATURES	3
TERMINOLOGY.....	5
AN INITIAL MODEL	7
CHOICE OF RESEARCH SITES, AND PRODUCTION SYSTEMS	7
FOOD PRODUCTION IN AND AROUND DAR ES SALAAM: CURRENT KNOWLEDGE AND ANALYSIS.....	9
METHODS.....	11
SECONDARY DATA	11
PRIMARY DATA COLLECTION	12
<i>Mwanza and Shinyanga milk study.....</i>	<i>12</i>
<i>Dar es Salaam and Mwanza poultry study.....</i>	<i>13</i>
MAPPING.....	13
FINDINGS	14
IDENTIFICATION OF ZONES.....	14
THE DAR ES SALAAM MILK SYSTEM.....	22
<i>Background.....</i>	<i>22</i>
<i>Present structure.....</i>	<i>33</i>
<i>Summary and observations</i>	<i>43</i>
THE MWANZA AND SHINYANGA MILK SYSTEMS	44
EGG AND POULTRY PRODUCTION IN AND AROUND DAR ES SALAAM AND MWANZA	46
<i>Inputs.....</i>	<i>46</i>
<i>Producers and production.....</i>	<i>54</i>
<i>Summary and observations</i>	<i>63</i>
AGRICULTURAL POLICY IMPLICATIONS OF AND FOR URBAN AND PERI-URBAN AGRICULTURE	65
CONCLUSIONS AND RECOMMENDATIONS.....	67
CONCLUSIONS.....	67
RECOMMENDATIONS	70
REFERENCES	72
APPENDICES	79
MILK SYSTEMS OF SMALLER AFRICAN CITIES: TWO EXAMPLES FROM TANZANIA (NYAMRUNDA & SUMBERG).....	79
FOOD PRODUCTION, URBAN AREAS AND AGRICULTURAL POLICY (ELLIS & SUMBERG).....	79
FOOD PRODUCTION IN AND AROUND URBAN AREAS: A BIBLIOGRAPHY WITH PARTICULAR REFERENCE TO LIVESTOCK, TANZANIA, AND SUB-SAHARAN AFRICA.....	79

LIST OF TABLES

TABLE 1. THE SCOPE OF THE RESEARCH.	7
TABLE 2. GOAT AND PIG POPULATIONS IN DAR ES SALAAM, 1985-1989.....	9
TABLE 3. COMPARISON OF THE STUDY SITES.	9
TABLE 4. NUMBER OF COMPLETED QUESTIONNAIRES AND INTERVIEWS, DAR ES.....	13
TABLE 5. DISTRIBUTION OF LAND AREA AND HUMAN POPULATION BY WARD TYPE.....	18
TABLE 6. AVERAGE POPULATION DENSITY BY WARD TYPE (PERSONS/KM ²).....	19
TABLE 7. DISTRIBUTION OF LAND AREA BY POPULATION DENSITY CLASS (%).....	19
TABLE 8. DISTRIBUTION OF POPULATION BY POPULATION DENSITY CLASS (%).....	20
TABLE 9. DISTRIBUTION OF LAND AND POPULATION BY WARD TYPE,.....	20
TABLE 10. KEY EVENTS IN THE DAR ES SALAAM DAIRY SYSTEM.....	23
TABLE 11. FOUR PHASES OF GOVERNMENT DAIRY POLICY AS THEY RELATE TO DAR ES SALAAM.	24
TABLE 12. SOURCES OF MILK MOVING INTO THE DAR ES SALAAM MARKET, 1966.....	27
TABLE 13. REGIONAL DISTRIBUTION OF DAIRY CATTLE AND OWNERS.....	35
TABLE 14. DISTRIBUTION OF DAIRY CATTLE BY WARD TYPE.	35
TABLE 15. DISTRIBUTION OF DAIRY CATTLE IN RELATION TO HUMAN.....	35
TABLE 16. DAIRY HERD CHARACTERISTICS, DAR ES SALAAM.....	36
TABLE 17. DISTRIBUTION OF HERDS LARGER THAN 20 HEAD.....	37
TABLE 18. ESTIMATED DAILY INFLOWS OF MILK TO DAR ES SALAAM.....	38
TABLE 19. SOURCE OF FRESH MILK DELIVERED TO TDL'S DAR ES SALAAM PLANT.....	39
TABLE 20. GENERAL CHARACTERISTICS OF TWO MILK PRODUCTION SYSTEMS.....	41
TABLE 21. FACTORS AFFECTING THE EVOLUTION OF URBAN DAIRY CATTLE POPULATIONS.....	42
TABLE 22. CURRENTLY ACTIVE HATCHERIES IN AND AROUND DAR ES SALAAM.	46
TABLE 23. OFFICIAL IMPORTS OF POULTRY BREEDING STOCK.....	47
TABLE 24. A TYPOLOGY OF HATCHERIES, DAR ES SALAAM.....	47
TABLE 25. CURRENTLY ACTIVE FEED MILLS IN AND AROUND DAR ES SALAAM.	49
TABLE 26. TYPOLOGY OF FEED MILLS, DAR ES SALAAM.....	49
TABLE 27. RETAIL PRICE OF POULTRY FEED, MARCH 1995 (TSH/50KG BAG).....	50
TABLE 28. TBS STANDARDS FOR POULTRY FEED.....	51
TABLE 29. CRUDE PROTEIN AND METABOLISABLE ENERGY (ME) OF LAYERS MASH SAMPLES.....	51
TABLE 30. ESTIMATED NUTRIENT VALUE OF POULTRY RATIONS.....	51
TABLE 31. RANGE OF POULTRY-RELATED PRODUCTS SOLD BY FEED AGENTS (% OF AGENTS WHO REPORT REGULARLY SELLING THESE PRODUCTS).	52
TABLE 32. SALES OF ALL FEEDS BY FEED AGENTS INTERVIEWED.....	52
TABLE 33. TOTAL ESTIMATED SALES OF POULTRY FEED BY AGENTS IN AND AROUND.....	53
TABLE 34. LOCATION OF CLIENTELE RELATIVE TO THE FEED AGENT.....	53
TABLE 35. TRANSPORTATION USED BY FEED AGENT CLIENTELE (% OF TRANSACTIONS).....	54
TABLE 36. SIZE OF TRANSACTION (% OF TRANSACTIONS).	54
TABLE 37. TYPOLOGY OF FEED AGENTS IN AND AROUND DAR ES SALAAM.....	55
TABLE 38. AGRICULTURE-RELATED OCCUPATIONS OF POULTRY PRODUCERS.....	55
TABLE 39. NON-AGRICULTURE RELATED OCCUPATIONS OF POULTRY PRODUCERS.....	56
TABLE 40. FLOCK SIZE INFORMATION FROM DAR ES SALAAM CUSTOMER SURVEY.....	56
TABLE 41. TOTAL NUMBER OF LAYERS REPORTED PER FARM.....	56
TABLE 42. NUMBER OF BATCHES OF LAYERS REPORTED PER FARM.....	57
TABLE 43. EGGS PRODUCED PER BIRD PER WEEK (BASED ON INDIVIDUAL BATCHES).....	58
TABLE 44. NUMBER OF TRAYS OF EGGS PRODUCED PER FARM PER DAY (TRAY = 30 EGGS).....	58
TABLE 45. REPORTED USE OF PURPOSE-BUILT HOUSING, AND FORMAL AND INFORMAL.....	59
TABLE 46. REPORTED USE OF PURPOSE-BUILT HOUSING, AND FORMAL AND INFORMAL.....	59
TABLE 47. TOTAL NUMBER OF BROILERS REPORTED PER FARM.....	59
TABLE 48. NUMBER OF BATCHES OF BROILERS REPORTED PER FARM.....	60
TABLE 49. REPORTED USE OF PURPOSE-BUILT HOUSING, AND FORMAL AND INFORMAL.....	62
TABLE 50. SOURCES OF INFORMATION ABOUT POULTRY PRODUCTION.....	62
TABLE 51. DISPOSAL OF MANURE.....	63
TABLE 52. REPORTED PLANS FOR THE FUTURE RELATING TO POULTRY PRODUCTION.....	64

LIST OF FIGURES

FIGURE 1. RELATIONSHIP BETWEEN DISTANCE FROM CITY CENTRE AND HUMAN POPULATION DENSITY.	18
FIGURE 2. OUTPUT OF COASTAL DAIRY INDUSTRIES LTD., 1970-1973.	28
FIGURE 3. OUTPUT OF TANZANIA DAIRIES LIMITED, DAR ES SALAAM PLANT, 1974-1994.	29
FIGURE 4. MILK DELIVERED TO TDL FROM MASAI HERDS.	31
FIGURE 5. GROWTH OF DAIRY CATTLE NUMBERS IN DAR ES SALAAM.	31
FIGURE 6. CUMULATIVE FREQUENCY DISTRIBUTION OF DAIRY CATTLE AND CATTLE OWNERS.	36
FIGURE 7. RELATIONSHIP BETWEEN HERD SIZE AND DISTANCE FROM CITY CENTRE.	37
FIGURE 8. CHANGES IN RETAIL PRICE OF MILK, MAIZE AND EGGS, 1990-1995.	40
FIGURE 9. POSSIBLE SCENARIOS FOR URBAN CATTLE POPULATIONS.	42
FIGURE 10. CHANGE IN RETAIL PRICE OF POULTRY FEED, DAR ES SALAAM.	50
FIGURE 11. SURVIVAL OF LAYERS OVER TIME, DAR ES SALAAM.	57
FIGURE 12. SURVIVAL OF LAYERS OVER TIME, MWANZA.	57
FIGURE 13. SURVIVAL OF BROILERS OVER TIME, DAR ES SALAAM.	60
FIGURE 14. EFFECT OF CHANGES IN SURVIVAL RATE AND EGG PRODUCTIVITY ON THE ESTIMATED FINANCIAL RETURNS TO KEEPING LAYERS.	61
FIGURE 15. EFFECT CHANGES IN SURVIVAL RATE ON FINANCIAL RETURNS TO KEEPING BROILERS.	61

LIST OF MAPS

MAP 1. DISTRICTS OF DAR ES SALAAM AND COAST REGIONS.	15
MAP 2. DISTRIBUTION OF WARDS BY TYPE, DAR ES SALAAM AND COAST REGIONS.	16
MAP 3. POPULATION DENSITY OF WARDS, DAR ES SALAAM AND COAST REGIONS. ..	17
MAP 4. DISTRIBUTION OF WARDS BY TYPE, MWANZA DISTRICT.	21
MAP 5. DISTRIBUTION OF DAIRY CATTLE IN AND AROUND DAR ES SALAAM.	34
MAP 6. DISTRIBUTION OF FEED MILLS AND FEED AGENTS.	48

NB: also see Appendix 1 for maps showing the origin of milk moving onto Mwanza and Shinyanga.

LIST OF ACRONYMS AND ABBREVIATIONS

CDC - Colonial (then Commonwealth) Development Corporation
CODAFA - Coastal Dairy Farmers Association
DAFCO - Dairy Farming Company Ltd.
DALDO - District Agriculture and Livestock Development Office
DOC - Day Old Chick
DVSAH - Department of Veterinary Science and Animal Husbandry
HBU - Heifer Breeding Unit
HPI - Heifer Project International
IDA - International Development Association
IDRC - International Development Research Centre
ILRI - International Livestock Research Institute (formerly ILCA and ILRAD)
KARI - Kenya Agricultural Research Institute
KCC - Kenya Co-operative Creameries
LIDA - Livestock Development Authority
LMU - Livestock Multiplication Unit
MALD - Ministry of Agriculture and Livestock Development
NAFCO - National Farming Company Ltd.
RALDO - Regional Agriculture and Livestock Development Office
S.D. - Standard Deviation
SDP - Sustainable Dar es Salaam Project
TANRIC - Tanzania Natural Resources Information Centre
TBS - Tanzania Bureau of Standards
TCC - Tanzania Co-operative Creameries
TDL - Tanzania Dairies Ltd.
TNA - Tanzania National Archives
Tsh - Tanzania shillings
WFP - World Food Programme

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SUMMARY

This paper reports the results of research conducted under grant X0290, Peri-Urban Livestock Production Systems in sub-Saharan Africa, awarded by the ODA RNRSS Livestock Production Research Programme. The research sought to describe and characterise livestock production activities in and around urban areas in Tanzania, and focused specifically on dairy, broiler and egg production and the cities of Dar es Salaam, Mwanza, and Shinyanga. The detailed findings are given in the main body of this report and the appendices which follow.

In addition to this report, which will be circulated to about 20 interested individuals and institutions in Tanzania and elsewhere, the outputs of this project to date include:

a bibliography containing over 400 entries relating to food production in and around urban areas, with particular reference to livestock, Tanzania and Africa (attached as Appendix 3, about 20 copies of a draft version were distributed to interested parties in Tanzania in August);

an academic paper focusing on agricultural policy as it relates to food production in and around cities (attached as Appendix 2, submitted to the journal World Development for review);

a draft academic paper comparing the milk systems serving Mwanza and Shinyanga (attached as Appendix 3, to be submitted for publication in the near future).

In addition, at least two additional journal papers are planned: one will focus on the history of interest in peri-urban milk production as a means of supplying Dar es Salaam, and the other on broiler and egg production around Dar es Salaam and Mwanza. This project has been the subject of two public presentations, and a further university seminar is planned for Spring 1997.

INTRODUCTION

As modified with the approval of the Livestock Production Research Programme Manager, the scientific and technical objectives of the research were:

- 1 To describe the (i) spatial characteristics, (ii) structure, and (iii) performance of peri-urban livestock production and marketing systems.
- 2 To analyse the links and differences between peri-urban and rural-based livestock production and marketing systems, and the implications of these in terms of policy, research and promotion.
- 3 To identify key areas for further technical research relating to livestock production and marketing in peri-urban areas.

Seen in another light, the objective of the research was to address the question: Is 'peri-urban' a useful category for classifying and analysing livestock production activities? In other words, is the peri-urban category useful from a research, policy or development programming perspective? Does it add analytical power to our understanding of livestock production systems, compared to terms such as 'commercial', 'intensive', and so forth?

The research reported here addresses these questions through an analysis of two major livestock production activities in and around three urban areas in Tanzania. In using both secondary sources and new field data the report attempts to place these production activities within a larger context. Thus in addition to present production activities, the report highlights historical, marketing and policy factors that are relevant for an understanding of the present state and future potential of food production systems in and around urban areas.

The report which follows begins with a discussion of the background and context of the current interest in livestock production in peri-urban areas. This review introduces key theoretical perspectives and synthesises the growing literature on agriculture in urban and peri-urban areas in Africa in general, and in Tanzania more specifically. The next section of the report presents the research methods. This is followed by what is in effect the main body of the report in which the research findings are presented and discussed. The final section contains conclusions and suggestions for further work.

BACKGROUND AND CONTEXT

In its Renewable Natural Resources Research Strategy for 1995-2005, the ODA included the 'Peri-urban Interface' as one of six priority production systems (the others being Semi-arid Production Systems, High Potential Production Systems, Hillside Production Systems, Forest/Agriculture Interface, and Land/Water Interface). The RNRRS defined the peri-urban interface as being: 'characterised by strong urban influences, easy access to markets, services and other inputs, ready supplies of labour, but relative shortage of land and risks from pollution and urban growth.'

This listing of priority production systems immediately raises a series of questions, as it is constructed along at least two major axes: agro-ecological potential on the one hand, and geographical location on the other. Thus peri-urban interface is described in terms of proximity to market, level of infrastructure, etc., without any *a priori* reference to agro-ecology or the physical, biological and environmental factors affecting present or potential agricultural productivity. It is obvious that specific sites or production systems may fall simultaneously into two if not three of the 'priority production systems'.¹ This seems to beg the question of the value of a category such as 'peri-urban interface', and this is one of the questions this research sought to address.

¹ As a case in point, the present research project was submitted and funded under the heading 'High Potential Area' and not 'Peri-Urban Interface'.

It is also important to note the recent increase in interest in agriculture in and around urban in the Third World. Over the last decade, 'urban agriculture' has emerged as a legitimate and widely recognised theme within development discourse, a theme than is being increasingly 'promoted' by development agencies. This increasing profile of agriculture in urban and peri-urban areas is illustrated by, for example, the attention it received at the UN's recent Habitat 2000 Conference in Istanbul (Anon. 1996), and recent appearance of several major publications (e.g. Smit et al. 1996; Egziabher et al. 1994; Mbiba 1995; Freeman 1991; Schilter 1991). In addition there is a rapidly growing body of more popular writing promoting the development potential of urban agriculture (e.g. Sachs 1985; Gutman 1986; Dana 1987; Lee 1993; Eberlee 1993; Mougeot 1994), particularly as a means of addressing urban food insecurity.

The growing interest in agriculture in and around urban areas is part and parcel of a wider re-assessment of the processes and outcomes of rapid urbanisation in the developing world, and of the relative emphasis that the problems of urban areas should receive relative to those in rural areas. Becker et al. (1994) have examined these issues specifically for Africa. The interest in urban food production must also be seen in the light of the much wider interest in popular participation, local initiative, small enterprise development, and the environmental impact of urbanisation.

The assumption underlying the present research is that planned livestock development activities and interventions in the peri-urban environment - i.e. the kinds of actions implicit in ODA's Livestock Research Programme Output 1.4 for High Potential Systems given as 'development of improved strategies for animal husbandry and nutrition in the intensive livestock systems in peri-urban areas' - must be based on an understanding of the structure and dynamics of the existing production systems in and around urban areas. This understanding must both start with and go beyond the technical elements and parameters of these livestock production activities, and explore the multi-faceted contexts within which these activities take place.

The original research proposal suggested that if livestock production systems in peri-urban areas could be shown to be significantly different from other production systems, then there would be a basis for an argument that different policy approaches and research and extension priorities might be justified in order to foster (or perhaps restrain) further livestock development in these areas.

Theoretical perspectives and relevant literatures

In addition to the more recent writing referred to above, an understanding of the history, dynamics and development potential of agriculture in urban and peri-urban areas must be grounded in the very substantial body of both theory and empirical research which touches on agriculture in these kinds of areas. The present discussion of the relationship between agriculture and cities owes much to the theoretical work of von Thünen (Hall 1966), which has informed and stimulated considerable research in both developed and developing countries. Given an isolated urban centre and an agricultural hinterland, von Thünen hypothesised a direct relationship between intensity of land use and proximity to the urban area.

Thus, agricultural land use around an isolated urban area would consist of an orderly and systematic progression dependent directly on the value of the commodities produced, their perishability, and the costs of transportation to the urban market.

An additional theoretical foundation to the discussion is provided by location theory which developed within the disciplines of geography and economics and the economic principle of comparative advantage. In effect these make explicit the importance of the natural resource endowment of an area, in addition to proximity to market and transportation costs, in determining the mix of agricultural activities.

The now substantial literature relating to agriculture in peri-urban areas within developed countries has been reviewed and synthesised by Bryant and Johnston (1992), who highlight the factors affecting land values and land use in the peri-urban zone, including speculation, uncertainty, and the incompatibility of different land uses. In the industrial countries, the development of advanced transportation and food handling systems is a major factor in explaining the increasing irrelevance of the von Thünen model.

The literature relating to agriculture in urban and peri-urban areas in Africa shares some common themes with work from the developed world but also highlights other areas of particular concern. In effect the literature on Africa treats agriculture in urban and peri-urban areas from five principle perspectives:

1. the determinants of the relative intensity of agricultural land use
2. the characteristics urban food and supply systems;
3. the implications for urban planning, including health, sanitation and environmental concerns;
4. the motivations of the individuals involved, with particular attention to household-level food security and livelihood strategies, responses to structural adjustment programmes, and the role of the informal economy;
5. as an element in the development of what are being referred to as 'sustainable cities', and the closed urban systems with which they are associated.

The von Thünen model has directly informed research on land use patterns around some African cities, and there have been a number of studies of patterns of agricultural land use around urban areas (e.g. Horvath 1969, Addis Ababa; Beeker & Guiebo 1994, Ouagadougou; Mortimore 1993, Kano). It is interesting to note that Jackson (1972) questioned the general relevance of the von Thünen model in explaining land use patterns around Africa settlements, in indicating that there is actually little direct evidence for the proposition that land use is determined by distance.

A second major area of research relates to the historical development of urban food systems in Africa, a literature brought together in Guyer (1987). While much of this work does not deal directly with food production in and around cities, the food

systems approach is valuable in putting urban and peri-urban food production in perspective.

The literature more directly addressing food production in and around cities deals with urban areas of different sizes and characteristics in all regions of Africa. Thus, in East Africa, Kampala (Maxwell & Zziwa 1993; Maxwell 1995), Nairobi (Lee-Smith et al. 1987; Lado 1990; Memon & Lee-Smith 1993; Freeman 1991, 1993), Lusaka (Sanyal 1985; Rakodi 1985, 1988a, 1988b), Dar es Salaam (Mattee et al. 1989; Briggs 1991; Mosha 1991; Mlozi et al 1992; Mlozi 1995; Mwanfupe 1995; Sawio 1993) and Harare (Drakakis-Smith & Kivell 1990; Drakakis-Smith 1992; Mbiba 1994, 1995; Drakakis-Smith et al. 1995), have received particular attention, while in West Africa, research has focused on Ibadan (Gbadegesin 1991; Tricaud 1987), Lomé (Schilter 1991), Kano (Mortimore 1993), Freetown (Tricaud 1987), and Ouagadougou (Beeker & Guiebo 1994; Manshard 1992; Metsch 1990).

Two of the major themes which emerge from this literature relate to the question of type of people who farm (i.e. recent migrants from the countryside or longer-term urban residents; poor people or civil servants), and the motivation behind urban and peri-urban food production activities (i.e. as survival strategy or as a commercial activity). Other key points of discussion include access to land, the role of city planning and government regulation, the health, environmental and gender implications of urban and peri-urban food production. Other authors have called attention to problems of child labour and the availability of extension services for urban and peri-urban producers.

Terminology

With the increased interest in agriculture in and around urban areas, and particularly as it has become a domain for development intervention, a number of terms and definitions have been proposed and some have come into common usage. Perhaps the most prominent of these terms is 'urban agriculture', which Mougeot (1994:1) defined as 'the production of food and non-food plant and tree crops and animal husbandry (livestock, fowl, fish, and so forth) both within (intra-) and fringing (peri-) built-up urban areas.' Other definitions of 'urban agriculture' have also been put forward, including 'crop growing and livestock keeping in cities' (Sawio 1993:1), 'growing crops and livestock keeping in intra-urban open spaces and peri-urban areas (Sawio 1994:25), and 'food production in urban and peri-urban areas' (Yeung 1990). In this report, however, the term urban agriculture is not used because it can give the impression that agricultural production activities which take place in and around cities are homogeneous, and that they are necessarily, and significantly, different from farming activities in non-urban environments. Neither of these propositions are likely to be generally true. Another reason for avoiding the use of the term urban agriculture is that it creates an artificial barrier between food production in and around cities and food production activities which take place in more distant areas, when in fact there are in many cases closely related (Ellis and Sumberg 1996).

One important problem with much of the literature on urban agriculture is a failure to adequately distinguish between activities which take place in urban environments on the one hand, and those in peri-urban areas on the other (Sumberg 1995; Ellis &

Sumberg 1996). As will become apparent from the results of this research, to make any real sense of the discussion in terms of research, policy or intervention, a clear distinction between urban and peri-urban is essential. In fact, the imprecision around this point in much of the literature, the inherent difficulties involved in determining the boundaries between urban, peri-urban and rural, and a degree of integration among the livestock production activities taking place in these three zones, meant that the research was forced to deal with livestock production in urban areas more explicitly than had been originally planned. In doing so the goal is to highlight the complementary and competitive relationships between livestock production activities in the three zones.

In the broadest sense the research is about (a) activities which result in the production of food (livestock products including meat and milk, and also grains, fruits and vegetables), in either (b) urban or (c) peri-urban settings. For the present purposes 'peri-urban' refers to that area 'whose structures and activities are modified by the presence or extension of one or more agglomerations' (OECD 1979).

Food production can take place for many different purposes and at different scales, and in most cases very different technologies can be used to produce the same or similar products. These differences of motivation, scale and technology can have important implications for policy and intervention, and thus should be made explicit. In relation to food production activities taking place in and around urban areas the following definitions will be useful:

garden: a generally small area of land devoted to the cultivation of flowers, fruit, or vegetables primarily for own use;

market garden: a piece of land on which vegetables are grown primarily for the market; hence market-gardener;

agriculture: the science and art of cultivating the soil; including the allied pursuits of gathering in the crops and rearing livestock; tillage, husbandry, farming (in the widest sense).

Specifically, in the context of this study, to be considered as an 'urban' or 'peri-urban' livestock production system two criteria must be satisfied: (a) the objective must be primarily commercial, and (b) major elements of the system must be located in either an urban or peri-urban setting, respectively. The research is not directly concerned, therefore, with livestock production activities which take place in urban or peri-urban areas which are primarily for direct home consumption (see Table 1). The implication of this is that some relatively small producers, whose activities probably look very similar to small-scale livestock production activities in rural areas (Briggs 1991), and who add relatively little to the supply of livestock products in the urban market, have essentially been eliminated from the scope of the study. However, this does not mean that the present research was simply a study of large-scale producers, for as will become apparent from the profiles of dairy and poultry producers, there is a large number of small-scale, commercial producers in the two study areas.

Table 1. The scope of the research.

Objective	Location		
	Urban	Peri-urban	Rural
Primarily commercial	In	In	Out
Primarily home consumption	Out	Out	Out

In = Within the scope of the present study; Out = Outside the scope of the present study

An initial model

Based on what has been said so far a simple conceptual model to explain the type and level of livestock production activity in a given peri-urban area can be constructed as follows:

Level of development of peri-urban livestock is related to:

an locale effect (relating to markets, transportation costs, input availability..) +

an agro-ecological effect (relating to climate, soils...) +

a complementarity effect (relating to interactions with other agriculture and natural resource management activities in the area) +

a competition effect (relating to the ability of other geographical areas to effectively produce and market commodities in the urban market) +

a historical effect +

a policy effect (relating to factors facilitating or constraining livestock activities)

The expectation is that the relative importance of these individual effects will vary, depending on the livestock species and the type of product. Thus, milk production may be more sensitive to agroecological and complimentarity effects than poultry, whereas egg production may be more sensitive to the locale effect than dairy.

Choice of research sites, and production systems

The research focused on one country (Tanzania), three urban areas (Dar es Salaam, Mwanza and Shinyanga), and three livestock commodities (milk, broilers and eggs). As such, there has never been any question of trying to justify these choices as particularly representative within Eastern Africa or the continent more generally. Each of the major urban areas in the region has its own unique history and characteristics, and it is difficult to conceive of this group of large urban areas as a meaningful population from which a 'representative' sample could be drawn. It is nevertheless true that these larger urban areas are of overwhelming importance in terms of the total urban population of the region. In fact, the objective was not to use the Dar es Salaam, Mwanza and Shinyanga areas as a sample from which to inferences could be made about other large and medium cities in East Africa. Rather, given the exploratory nature of the research, the hope was simply to use

these three areas to highlight and explore issues which might deserve to be considered more generally.

In the light of these considerations, the three cities in Tanzania present themselves as reasonable choices for the study for a number of reasons. In the first place, Dar es Salaam, Mwanza and Shinyanga represent three very distinct levels in the urban hierarchy of Tanzania. While Mwanza is the second largest city in Tanzania, and a growing and economically dynamic agglomeration, it has perhaps only a quarter of the population of Dar es Salaam. This difference in size provides an opportunity to explore issues of scale, complexity and control as they relate to livestock production and marketing in urban and peri-urban areas. Shinyanga, while located in a relatively productive agricultural and livestock area, is only half the size of Mwanza and its urban infrastructure is considerably less developed.

There is a large body of relevant scholarship relating to the Dar es Salaam area. This includes work on the historical development of the city (Leslie 1963; De Blij 1963; Mascarenhas 1966; Sutton 1970) and its food system (Bryceson 1985 & 1987; Sporrek 1985). There have also been a number of more recent studies of changes in settlement patterns and land use in and around Dar es Salaam (Kyesse 1990; Briggs 1991; Sawio 1993; Mwamfupe 1994; Kombe 1994; Timothy 1995). The city's present supply systems and consumption patterns for horticultural produce and livestock products have received some attention (Mullens 1993; Airey 1995; Lynch 1994; Kurwijila et al. 1995), while various aspects of agriculture and livestock production in the Dar es Salaam urban and peri-urban areas have generated considerable interest (Mtwewe 1987; Bangole 1988; Shauri 1989; Mlozi et al. 1989 & 1992; Tukay 1990; Briggs 1991; Mvena et al. 1991; Ngoda 1991; Moshia 1991; Mlozi 1991, 1995a & 1995b; Lupala 1993; Sawio 1993 & 1994; Schippers & Lewcock 1994; Mwamfupe 1994).

There is also a significant body of relevant technical, socio-economic and policy-related work on dairy production in the Mombassa (Kenya) peri-urban zone generated by the KARI-ILRI collaborative programme (see KARI & ILRI 1996a & 1996b). The coastal agro-ecological conditions around Mombassa are very similar to those around Dar es Salaam, and Mullens (1993) uses this fact to justify a comparison of the two coastal cities in terms of dairy consumption and the implications of alternative dairy policies for peri-urban dairy development.

If there is an abundance of literature pertaining to Dar es Salaam the situation for Mwanza and Shinyanga is very different. While there is a good deal of literature on all aspects of agriculture in rural Sukumaland, there is relatively little on Mwanza town and its immediate surroundings (but see Greble 1971). During the course of this study no relevant work on the food system of Shinyanga town was identified.

Another reason that Tanzania presents itself as an interesting case is that it is currently in a dynamic period of change, which represent a major break with past political, economic and agricultural policies. These moves toward liberalisation have already been cited by Briggs (1991) as having potentially important impacts on agriculture and land-use in the Dar es Salaam peri-urban zone. In terms of livestock there have been major shifts in policy which have meant the decline in importance of large-scale, parastatal production units and input supply organisations such as

Tanzania Dairies Ltd. (TDL), Dairy Farming Company (DAFCO), National Poultry Company (NAPOCO), and Livestock Multiplication Units (LMU) and Heifer Breeding Units (HBU). At the same time there has been the emergence of significant private sector initiatives in poultry and to a lesser extent dairy, as well as several development interventions aimed specifically at urban and peri-urban livestock producers (Auerbock et al. 1993; Kinsey 1994; Mtumwa & Tesha 1996).

One question which might be asked is whether there were other possibly choices of livestock species, products or production systems? In fact, apart from dairy and poultry the choices were limited. While figures given by Tukay (1990) show a significant increase in the numbers of goats and pigs in Dar es Salaam between 1985/86 and 1988/89, the totals are still relatively small (Table 2). As for beef and sheep meat, the vast majority of all red meat consumed in Dar es Salaam comes from up-country through the market at Pugu (Airey 1995) and it is hard to see any significant urban or peri-urban advantage for these commodities. The land area and populations of Dar es Salaam, Mwanza and Shinyanga presented in Table 3.

Table 2. Goat and pig populations in Dar es Salaam, 1985-1989.

Species	Year			
	85/86	86/87	87/88	88/89
Goats	2,618	3,820	5,764	6,218
Pigs	8,601	10,454	13,378	15,638

Source: Tukay (1990) based on data from the Dar es Salaam City Livestock Officer.

Table 3. Comparison of the study sites.

Characteristic	Dar es Salaam Region	Mwanza District	Shinyanga (Urban) District
Land area (km ²)	1,396	?	?
Human population (1988)	1,360,850	223,013	100,724
No. of wards (1988)	52	20	13
Avg. annual rainfall (mm)	1,000	1,256 (1986-1990)	700

Sources: Bureau of Statistics (n.d.)

Food production in and around Dar es Salaam: current knowledge and analysis

As indicated in the previous section there is a considerable body of literature which relates directly or indirectly to food production in and around Dar es Salaam. Some of this literature is specifically focused on the peri-urban zone and some on livestock production. The objective of this section is to briefly review this literature so that key issues can be identified.

Briggs (1991) studied crop production in the Dar es Salaam peri-urban zone. While he observed that there was little difference between the nature of these activities (crop combinations etc.) and those taking place in rural areas, he did conclude that farming in the peri-urban zone was becoming more market oriented. Briggs placed this growing market orientation in the context of the larger changes taking place in the Tanzanian economy, including the reduction in real wages and moves toward

liberalisation. Mwanfupe (1994) also observed a growing responsiveness on the part of farmers in the peri-urban zone to opportunities afforded by urban markets. He noted, however, considerable variation in land use patterns and intensity within the peri-urban zone. The land use maps which he presents show clearly the relationship between the major roads leading from the city and uneven development within the peri-urban area.

In fact, food production within Dar es Salaam itself has received more attention than has the peri-urban zone. Thus, Sawio (1993) undertook a major study of 'urban agriculture' including both crops and livestock, while Mlozi (1995) focused on problems of environmental degradation due to livestock production within Dar es Salaam. Sawio is definitely a promoter of urban agriculture, arguing that it makes a significant contribution to food security and represents a major form of urban land use. Mlozi, on the other hand, makes a total of 14 recommendations aimed at lessening the negative environmental impacts of urban agriculture, and particular livestock keeping. He is particularly concerned with the role that education and information can play in this regard. Both authors note the fact that urban food producers cannot be neatly classified, although those keeping livestock are likely to come from professional groups or be civil servants.

In addition to these major studies there have been a whole series of studies relating various aspects of urban agriculture in Dar es Salaam. Thus, Mvena et al. (1991) included Dar es Salaam as one site in their IDRC financed study of urban agriculture in six towns in Tanzania. Unfortunately the report of this work appears to contain relatively little analysis of results of the massive questionnaire which was administered. These authors also expressed concern over the negative environmental impacts of urban livestock production (also see Mlozi 1989). Other authors such as Bangole (1988), Tukay (1990) and Auerböck et al. (1993) have attempted to describe dairy farming in Dar es Salaam, while Shauri (1989) looked at urban agriculture more generally. Compared to the attention given to vegetable and milk production, poultry production as an urban and peri-urban activity has been relatively neglected.

Throughout much of this literature, there is a sense that the mechanisms which should regulate urban agriculture are generally non-functional, and given the participation of civil servants and other well-placed individuals in these activities, and perhaps particularly dairy and poultry production, there is little realistic chance for significant change. This sentiment is summed up in the following extract:

"Livestock keeping in the city (Dar es Salaam) is a political issue and only a political formula can solve it" said one Dar es Salaam city council veterinary officer recently. Prominent livestock keepers in the city are also at the top of the decision-making machinery in the city. Dar es Salaam city council needs to build up the courage and say: "Please put your animals under zero grazing." *Sunday News*, 8/4/90:

The literature specifically about Dar es Salaam addresses a number of questions and issues that are common to the discussion of urban agriculture in Africa. Thus, much is made of who actually farms: is urban agriculture a residue of rural life and patterns of behaviour, or a truly urban adaptation to changing circumstances? Most

authors agree that longer-term urban residents can more easily gain access to land, and that both the poor and professional groups grow and market food (see Ellis & Sumberg 1996). This has important implications for the discussion of development interventions focused on urban agriculture. There is also the question of how urban agriculture should be interpreted: Is it simply a temporary adaptation to difficult economic circumstances, or is it better seen as a school in which women and others can learn the basics of entrepreneurship (Freeman 1993)?

One worrying aspect of much of the literature in relation to food production in and around Dar es Salaam is that the often made claim of its increasing incidence is seldom convincingly supported. There can be no question that certain aspects of urban food production have increased, as indicated, for example, by the growth in the number of dairy cattle. However, as there is little historical material which would enable a more encompassing analysis over time, this question remains open.

METHODS

This was largely an exploratory study that sought to assemble and analyse information concerning the production of livestock commodities in and around urban areas. A flexible approach to data collection was therefore adopted. Where available, much reliance was put on the analysis of secondary data and re-examination of the results of previous research. Where secondary information was limited or of dubious quality, greater emphasis was placed on primary data collection. Specifically, the analysis of the Dar es Salaam milk system was derived almost entirely from secondary sources while the analyses of the Mwanza and Shinyanga milk systems and the Dar es Salaam and Mwanza poultry and egg systems necessitated the collection of considerable primary data. The sections which follow identify key secondary data sources and primary data collection methods.

Secondary data

The lowest spatial unit of analysis used in this study is the ward, an administrative sub-division which aggregate to Divisions, Districts and Regions. Ward names, boundaries, geographical codes (i.e. urban, rural or mixed, hereafter referred to as ward 'type') and human population estimates were taken from the maps and publications associated with the last national census undertaken in 1988 (Bureau of Statistics n.d.). While new wards have subsequently been created, and there has been significant growth in the population of the three cities studied, no attempt was made to estimate population growth since 1988.

The last complete livestock census was undertaken in Tanzania in 1984 (MALD 1986). While the census reported details such as type (indigenous or grade), sex and age of cattle, there is a specific note in the introduction of the report which cautions that the figures for Dar es Salaam are not likely to be accurate (MALD 1986:1). Since 1984 there have been a number of national sample surveys of the agricultural sector undertaken by the Ministry of Agriculture and Livestock Development (MALD), but again the estimated livestock populations in urban areas are thought to be suspect (e.g., Statistics Unit 1994). Thus, in order to estimate the

population of grade dairy cattle in and around Dar es Salaam it was necessary to rely on lists developed by the district veterinary officers during the last rinderpest vaccination campaign which took place during 1992. These lists indicate the total number of dairy cattle for each owner, and are thought to give a reasonably accurate picture for that moment in time. There is every reason to believe that grade cattle populations have increased since 1992, but again no attempt was made to estimate these increases. Grade dairy cattle populations for the wards of Mwanza and Shinyanga Districts were obtained from the District Agricultural and Livestock Development Office (DALDO), which keep an updated list of owners and cattle numbers. These lists is thought to more or less accurately reflect the current situation. Estimates of the total population of dairy cattle in Mwanza District from 1986 to 1996 were extracted from the DALDO monthly reports.

There are no estimates of the number of poultry producers, birds or levels of production in Dar es Salaam or Mwanza which are thought to be particularly accurate.

Data on milk, egg, chicken and grain prices in Dar es Salaam and Mwanza since 1990 were extracted from reports of the Marketing Development Bureau of the MALD. Other data were extracted from records and documents of Tanzania Dairies Ltd. (TDL) (geographical origin of fresh milk deliveries to the Dar es Salaam plant from 1992 to 1995); MALD (import licences granted for poultry breeding stock and day old chicks [DOCs] from 1990 to 1996); and several private firms and traders. In addition, government policy documents, reports and studies as well as consultants' reports and published academic papers were invaluable sources of additional secondary data. As sources of recent data on milk production and consumption in and around Dar es Salaam work by Auerböck et al. (1993), Kurwijila et al. (1995) and Kurwijila & Hendriksen (1995) was particularly helpful. Historical data on the dairy and milk situation in and around Dar es Salaam was gathered from the Annual Reports of the Department of Veterinary Science and Animal Husbandry (DVSAH), the Veterinary Division of the Ministry of Agriculture and the files of the Tanzania National Archives (TNA). It should be noted that documentary information relating to events after 1960 is scarce as little has been added to the archives since this date. The closure of the head office of Tanzania Dairies Ltd. in Arusha in November 1995, just days before our scheduled visit, further compounded the problem of access to key historical information.

Primary data collection

Mwanza and Shinyanga milk study

This study consisted of two distinct data collection exercises. In the first the men who transport milk into these cities on bicycle from the surrounding countryside (hereafter referred to as 'milkmen') were interviewed; and in the second, owners of grade dairy cattle located within the urban boundaries were interviewed. Full details of the methods are given in Nyamrunda and Sumberg (1996), which appears as Appendix 1 of this report. In brief, data were gathered from 217 individual milkmen entering Mwanza and 74 entering Shinyanga, and interviews were conducted with urban producers in 7 of 22 wards in Mwanza and 4 of 13 wards in Shinyanga. Overall, 168 interviews were conducted with urban producers in Mwanza and 80

were conducted in Shinyanga, which represents approximately 12% and 10% of urban dairy producers in Mwanza and Shinyanga respectively.

Dar es Salaam and Mwanza poultry study

This study consisted of a series of data gathering exercises which included:

- (i) an inventory of all functional feed mills and hatcheries, which included information on types and levels of production, and the nature of distribution systems;
- (ii) a survey of poultry feed retailers (hereafter referred to as 'feed agents') in four wards in and around Dar es Salaam, which generated information concerning products sold, approximate levels of sales, and some socio-economic information about the owners of these retail outlets;
- (iii) a survey of customers of three feed agents, which generated information concerning feed purchasing patterns, bird type and flock sizes, and acted to introduce the researcher to producers who might be willing to participate in the more detailed producer survey;
- (iv) a survey of poultry producers which yielded detailed information on flock ages and sizes, levels of mortality and production, marketing channels, sources of information about poultry, uses of manure, and other economic activities of the producers;
- (v) sampling and chemical analysis of poultry feeds, which resulted in 36 samples of layers mash being analysed for crude protein and metabolisable energy (ME) by Natural Resource Management Ltd., of Bracknell, UK.

The total number of completed questionnaires is shown in Table 4. Data were coded and analysed using SPSS and Lotus 123 software.

Table 4. Number of completed questionnaires and interviews, Dar es Salaam and Mwanza poultry study.

Survey	Dar es Salaam	Mwanza
Feed Agent	46	6
	188	x
	62	50

Mapping

As indicated previously maps provided by the Census Office were used to determine the boundaries of wards. Depending on the area covered these maps ranged in scale from 1:20,000 to 1:500,000. Maps of ward boundaries are not geo-referenced, which presents certain problems in integrating information from these maps with that from other sources. Satisfactory maps of ward boundary could not be obtained for Mwanza Region or Shinyanga District. Digitised maps of Dar es Salaam were obtained in Atlas GIS format from the Sustainable Dar es Salaam Project. These coverages included district and ward boundaries, the transportation network, soil