

**POTENTIAL FOR PERIODIC MARKETS AS NODES OF FOOD TRADE
AND TERRITORIAL DEVELOPMENT: A CASE OF MACHAKOS-KITUI
ROAD, MACHAKOS COUNTY, KENYA**

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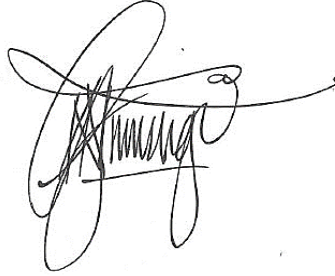
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DECLARATION

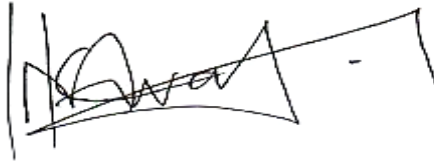
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I dedicate this dissertation to my parents: Dr Patrick Wambua and Dr Alice Wairimu and my siblings: Dr Caroline Mutio, Ms Irene Nyaitaha and Mr Pharis Mukui.

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ABSTRACT

Sustainable agriculture and healthy food standards, applicable to a changing climate; with the capacity to preserve existing ecosystems; are among the more significant policy contributions that can neither be overlooked nor over-emphasised. Notably so with the burgeoning human population. Agriculture evolves with people, trends, and needs. However, with periodic farmers markets, due to the primal notion of food as a basic need, this can be considered a driving force to growth, development, and even the death of agriculture. We are what we eat after all. Understanding the dynamics that revolve around contextual push-pull factors within the sector and how these markets motivate development, change, and subsequent evolution of urban morphology, are key to finding the elusive links between rural and urban planning, food security, sustainable communities, contextual economies, poverty mitigation, and even urbanisation. The culmination of these factors is an amalgamation of characteristics that define sustainable integration of food systems or lack thereof with the rapidly growing human population.

The study seeks comprehension of the impacts of food supply chains in periodic farmers markets, while also assessing the extent to which these factors influence territorial development. The study identifies major markets in the periodic circuit. It also finds various resultant alternate periodic markets which play a role in the territorial development of the rural hinterlands that can be considered the regional catchment of the primary periodic market circuit. To arrive at this deduction, the study incorporates data collected from various traders, farmers, farmer-traders, market brokers, business communities, consumers, several transport sector interest-holders and stakeholders, security forces, local administration, as well as households within the regional catchment.

The study alludes to both direct and indirect correlations of factors that play a role in the food trade. The impacts of climate change on food security, food deserts, and food distribution are combined with the aftermath of the Covid-19 pandemic to act as cause and effect for the circulation of currency and the resultant socio-economic capacity. While these variables are perceived to create differing economic environments, the adoption of various altruistic mitigation measures within the contextual setting seems to find means of sanitizing the already harsh economic environment.

Food distribution dictates rural autonomy, more so in Kenya where agriculture dominates the country's GDP. By ensuring food security, rural development and spatial planning can thereafter be considered. Asset mapping of the regionalised context facilitates the establishment of plausible navigability of these phenomena, thereby necessitating this study in the approach endeavoured.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

The reciprocal exchange of goods, services and currency for the same or the other, have since the dawn of human civilisation defined community spaces. Anthropological literature has produced detailed ethnographic descriptions of markets, especially periodic market systems in both rural and growing urban areas around the world (Gregory, 2001), citing the gift exchange systems, commodity categorisation and manner of articulation with the various markets both locally and internationally.

The nature of the periodic farmers markets in Machakos County in South-Eastern Kenya offers a unique view into how traditional practice infused into contemporary planning has led to systematic growth of market neighbourhoods and subsequent death of others along transport corridors. On focus in this study, is the periodic market circuit along the Machakos-Kitui road which comprises defined nodal centres, created in the interest of agricultural input and produce exchange. While a market is defined as a set of actual or potential customers of a given good or service supply (Thill, 2015), the geo-spatial extends of physical farmers markets call for a broader scope on definition and spatial planning consideration. Farmers markets are thus seen as arenas for territorial expression, aboding the socio-economic and consequently contextual significance of a commercial node to its regional setting.

The Machakos-Kitui road periodic market circuit attracts the attention of not just Machakos County but also adjacent Makueni and Kitui Counties. The simultaneous injection of food both to and from the rural hinterlands is heavily dependent on the success of these markets as nodal points of socio-economic interaction. The periodic nature of trade allows for equitable distribution of resources and capital for each participating market centre, which inherently prompts development in both agricultural and non-agricultural sectors.

The promulgation of the Kenya Constitution 2010 ushered in a barrage of key reforms, amongst which devolved functions of counties. Anchored in part 2 of the Fourth Schedule is the devolved framework for the agriculture in the context of county governments. This relegates the exclusive responsibility of agricultural policy formulation to the national government, while mandating that county governments be responsible for: the facilitation; implementation; oversight; monitoring and evaluation of all matters agriculture. This includes: *crop and animal husbandry; fisheries; plant and animal disease control; livestock sale yards; and county abattoirs*. This is added to indirect induction of agricultural activities in animal control and welfare as in the case of: *licencing of dogs; as well as facilities for accommodation, care and burial of animals*. Through the onset of devolution, a decade along, concepts of regionalism and

territorial development have motivated contextual growth of agriculture, prompting changing dynamics driven by both technology and climate change. However, the nature of available markets remains physically unchanged which exerts pressure on the passé planning systems of these growing nodes.

The origins and prevalence of periodic farmers markets is elucidated in terms of inertia, needs of producers, traditional organisation of time and comparative advantage (Bromley, Symanski, & Good, 1975). Meaning that, while the market days are more often than not determined by the local authorities, the viability, physical planning, socio-economic and environmental impact may go unconsidered. The concept of sustainability may have for a long time been perceived as superfluous by local authorities especially, considering that the niche 'suitable' set of needs are met and conveyed. This is also evident in relation to the levies paid and the 'reasonable' space provided for trade by the local authorities. Current occurrences resulting from inadequate spatial provision, encroachment into road reserves and human-livestock-vehicle conflict can be seen as evidence for need of comprehensive planning of these unique markets. This calls for the analysis of the markets as both stand-alone planning place-holders and as part of an interconnected agro-economic system and commercial network for the resident and allied communities within the hinterlands as well as the direct market users.

1.1 Background of Study

The failure to consider access to food resources in an integral way may result in disparities in nutritional prospects among populations (Jones & Bhatia, 2011). Farmers markets form a vital part of local-economy development. This is evident in provision of avenues for incubation of small, local, contextual and micro-enterprises. This is especially critical in developing economies as it assures local recycling of currency, territorial development and socio-economic security. As a product of the Agriculture Sector, Farmers Markets are impacted directly and by association a majority of the SDG. Adopted by all UN member states in 2015, The 2030 Agenda for Sustainable Development was considered a blueprint for peace and prosperity for people and the planet¹. However, a few efforts in this well documented concept have been met by unforeseen retardation as a consequence of the COVID-19 pandemic and even more aggravated by the ongoing socio-economic upheavals, civil disputes throughout the world and the resultant disruption of supply chains. Of focus in this study are 6no. SDG, introduced in staggering intervals depending on circumstance of applicability.

These include: 1. *ending poverty in all its forms everywhere*; 2. *ending hunger, achieving food security and improved nutrition and the promotion of sustainable agriculture*; 9. *building resilient infrastructure, promoting inclusive and sustainable industrialisation and fostering innovation*; 10. *reducing inequality*

¹ [THE 17 GOALS | Sustainable Development \(un.org\)](https://www.un.org/sustainabledevelopment/)

within and among countries; 12. ensuring sustainable consumption and production patterns; taking urgent action to combat climate change and its impacts*; 15. protecting, restoring and promotion of sustainable use of terrestrial ecosystems, sustainable management of forests, combating desertification, and halting and reversing land degradation and halting biodiversity loss. While these goals remain conceptual in nature, the fact that they allude to vital nodes in the Kenyan socio-economic fabric makes them important to consider.

African Union - In the AU Agenda 2063, the call to action presages the development of various sectors as key-holders of comprehensive development in the African continent, with the first being *the eradication of poverty*. The majority of African states relies heavily on Agriculture for sustenance, growth and development. Hence, the need for asset-mapping of agricultural potential, production and subsequent evolution as the roadmap to achieving cumulative growth. The point of entry of Agriculture to the regional market lacks formal definition. However, need still holds on the vitality of the sector to the sustenance of regional growth, partnerships and as a consequence of climate change, regional peace. Adoption of sub-sections 72d², e³, and f⁴ of Agenda 2063 would require meticulous cooperation between the National and local sectors of Agriculture and commerce; Human health and Nutrition, water and sanitation, policy-makers, traders, educators, conservation experts, consultants in the built environment and most importantly, the end-users. Supply dictates policy, demand mandates supply, knowledge or lack thereof dictates demand, policy determines education and motive derives policy. The chain comes full circle once the veil reveals the subjectivity of poverty with the basis of it all being the availability or lack thereof food.

Kenya - Considered major contributors to Kenya's GDP at about 35.151%⁵, Agriculture, forestry, fisheries and their value addition play a significant role in maintaining Kenya's economy. The increase in contribution in GDP over the years as accounted for in Table 1, indicates the importance of the sector to the nation's cumulative development. This was more-so felt with the aftermath of Covid-19, which saw to the contraction of the global economy. In Kenya, a contraction of GDP was recorded at 5.0% in 2019, while at 0.3% in 2020 by Treasury. Of note is that this was least felt by Agriculture, Forestry and Fishing activities which experienced vibrancy, contrary to global demand in 2020 (KNBS, 2021) . Treasury recorded that despite contraction in growth by sectors across the board, the economy 'somehow' survived due to the accelerated growth in Agricultural production at 4.8%. This retained the sector-dominance of

² d. Transform, grow and industrialise our economies through beneficiaries and value addition of natural resources.

³ e. Consolidate the modernisation of African agriculture and agro-business

⁴ f. Act with a sense of urgency on climate change and the environment. (AU, 2015)

⁵The World Bank data - [Agriculture, forestry, and fishing, value added \(% of GDP\) - Kenya | Data \(worldbank.org\)](https://data.worldbank.org/AG.AGVS.VS.CD?locations=KE)

Agriculture accounting for approximately 23% of total value of the economy in 2020. Which elucidates how Kenya as a country, heavily relies on Agriculture.

Table 1: GDP percentages per year in Kenya (KNBS, 2021) table 2.1 p32

Gross Domestic Product by Activity	Current prices, Kshs. Million									
	2016	%	2017	%	2018	%	2019	%	2020	%
Agriculture, forestry and fishing	1,521,434	20.0	1,772,490	20.9	1,897,475	20.3	2,171,071	21.2	2,478,303	23.0
Growing of crops	1,072,482	14.1	1,293,474	15.2	1,356,544	14.5	1,543,999	15.1	1,782,191	16.6
Animal production	307,167	4.0	314,308	3.7	341,275	3.7	354,702	3.5	383,014	3.6
Support activities to agriculture	16,627,19,403	0.2	22,643	0.2	24,985	0.2	25,618	0.2		3.6
Forestry & logging	94,562	1.2	102,617	1.2	125,979	1.3	189,816	1.9	224,688	0.2
Fishing & aquaculture	30,595	0.4	42,687	0.5	51,034	0.5	57,569	0.6	62,792	2.1
GDP at market prices	7,594,064	100	8,483,396	100	9,340,307	100	10,255,654	100	10,752,992	100

1.2 Statement of The Problem

In a dynamic world, where change is the only thing that is constant, human beings gravitate towards expanding occupied territory and discovering new crevices, technologies and attempting novel concepts in attempt to keep up with the times. This is beneficial in the long-run as it enhances the perceived sense of efficiency and extends aid to the far reaches of the planet. However, even in the race towards the new, the basics need still be covered. Food security and clean potable water features in 11no. of the Sustainable Development Goals. Be it in poverty eradication; good health and wellness; clean water and sanitation; decent work and economic growth; industry innovation and infrastructure; sustainable cities and communities; responsible consumption and production; climate action; life below water as well as life on land, the search for food is the fundamental root of development in many developing countries.

With the increase in population and densities in urban areas, the issue of open public spaces is becoming more difficult to manage. Farmers markets have historically been considered core place-makers in developing centres. They act as foci for interaction, commerce, exchange of goods, services and ideas, congregation, politicking, religious indoctrination, to state but a few. While the number of users has significantly increased, so has the need for more space to cater for the growing consumer base. However, as the areas around the markets develop, there is a limit to the amount of expansion that can occur. This results in the distortion of the initial design, if any, paving way for chaos. This is a consequence of mushrooming of unsustainable, more often than not make-shift stands availed for use for and/or by the increasing number of traders and consumers. This has historically culminated in the compromise of the

transport networks resulting in increased congestion, motor collisions, accidents and incidents, as well as loss of property. Inadequate and/ or lack of planning can be pinned as a root cause of these issues as the much-needed forecasting seems to have been forfeited resulting in failure to consider the growth of the urban areas with relation the market environs and the constant diminishing available open spaces. Of interest is the planning for use, access, mobility and functionality of the aforementioned farmers markets, the impact that physical planning has on the successful development of the adjacent urban centres and the socio-economic foot-print of the resultant towns along the Machakos-Kitui road in Machakos County.

The major markets to be investigated in this case include: **Masii farmers market**, **Wamūnyū market centre** and **Katangi market centre**, all within Machakos County; among a host of other interdependent minor markets within proximity of said main markets. These market and administrative centres are of critical importance in facilitating exchanges between rural and urban areas. Rural populations depend on these urban services, including access to traders and markets to dispose of their agricultural produce and to access the retail stores and other facilities located in local urban centres. The intermediate centres also provide employment opportunities for rural populations and may, in some cases, help to decrease migration pressure on the larger urban centres. (White, 2005)

This study seeks to appraise factors influencing the existence of the periodic markets along Machakos-Kitui road and how they have prompted growth of the towns in which they reside. It evaluates the influence these markets have had on physical development, as well as the origin of the mobile concept. The study evaluates push and pull factors motivating the vibrance and user needs of the road corridor, the available infrastructure versus the deficiencies.

1.3 Research Questions

1. How do the periodic farmers markets influence the physical development of their contextual setting?
2. What is the socio-economic contribution of the periodic farmers markets to local economies?
3. How does planning in a post-pandemic era influence development of rural-urban linkages
4. How can urban planning influence spatial use of periodic farmers markets? From user-friendliness, user perception, functionality to accessibility?

1.4 Research Objectives

The study has one overall objective and four specific research objectives.

1.4.1 Overall Research Objective

The overall objective of the study is to appraise the potential for periodic markets as avenues for food trade, agricultural influence, socio-economic empowerment of related rural hinterlands and the resultant development of the catchment area.

1.4.2 Specific Objectives

The four objectives of the study are:

1. To analyse the impacts of periodic farmers markets on the development of their contextual setting
2. To assess the contribution of periodic farmers markets to the local economy
3. To evaluate periodic farmers markets interventions for resilient rural-urban linkages in a post-pandemic era
4. To propose planning interventions for periodic farmers markets on spatial use

1.5 Assumptions of The Study

This study theorises that sustainability in planning for periodic markets can result in the socio-economic development of rural areas and feasible growth of resultant urban centres without compromising the Agricultural sector. This is to mean that planning for periodic markets, as interdependent elements of the rural-urban continuum, can ensure protection of the Agricultural sector, motivate growth of the sector and result in sustainable development. This also dissuades rapid urbanisation, urban sprawl and dangers resulting from compromising food security due to change of land-use. The study assumes that while the market centres in the periodic farmers market circuit operate as a collective, each market carries its bespoke characteristics which make it stand out as an independent urbanisation node and point of rural-urban linkage.

1.6 Justification of The Study

Sustainable Agriculture, Action against climate change and food security are among a host of the heavily deliberated conversations of the COP26 – 2021 in Glasgow. These are old issues constantly brought up with footing of the problems shifting through economics, the environment and development; leaving behind the fundamental protagonists of both the devastation and possibility for change – the farmers. UN Sustainable Development Goals, AU Agenda 2063, Kenya’s Vision 2030 and even the more recent Big Four Agenda, all have in common a narrative on the importance of food security and local economies. However, as the global climate changes; need for food increases; and agro-ecological areas experience rapid urbanisation and sprawl, the danger of food availability or lack thereof looms.

Environmental policy often interacts with agricultural markets to produce unexpected outcomes. Increased attention has recently focused on the shapes of demand and supply functions in the Kenyan Agricultural sector with contemptable agricultural policies restricting various agricultural practices in various parts of the nation. The results illustrate a clear nonlinear relationship between competitiveness and product prices (Schaufele, 2021). With the economic crisis even prior to COVID-19, and the global recession after it, populations in developing countries stand at a higher risk of failure to consume a healthy diet. This brings about the phenomenon of the *food deserts*. Where the barriers to consumption of

a healthy diet may be classified by whether such barriers are financial, or derived from the mental attitude and knowledge of the consumer; with the perception of ‘unsupported food environments’ by some consumers being contrasted with geographical existence of multiple sources of fresh fruit and vegetables in certain locations (Shaw, 2006). A study on consumerism in farmers markets in the USA deduced that, ‘income did not significantly influence the probability of shopping at a farmers’ market. However, the probability of shopping at a farmers’ market was significantly reduced if the respondents perceived that cost was the most important characteristic of food. These characteristics imply limited appeal of farmers markets currently to convenience-oriented, single-person and single-parent households (Zepeda, 2009).’

As an avenue for trade, exchange of ideas and case study, farmers markets play a key role in community development. They allow for access for choice of fresh agricultural produce from the resident farmers, from all over the country, and even the region. This opens up options for consumers, creates opportunity for better nutrition and allows for price negotiation. However, lacklustre control mechanisms in the standardisation of produce and agricultural products, unfavourable market conditions for farmers, poor design and planning of markets generally lead to substantial loss of investment and farm produce.

The aforementioned periodic markets comprising Masii market centre, Wamũnyũ and Katangi markets and the supporting Kaseve wholesale market, have over the years created a network that has given allowance to the congregation and socialisation of people, the development of the sense of neighbourhoods, socio-economic security and promotion of various agro-economic endeavours. While the market days are pre-determined by the authorities, the various stakeholders have found ways of fitting into the melee and evolving with it. A study on the planning for these collective periodic farmers markets not only investigates the unique attributes of each individual market and its environs but also how they feed into the socio-economic and cultural entities of the emerging towns contextual to the Machakos-Kitui road. This will help delineate the desired functioning of the markets, identify appropriate scales of operation where needed, and propose sustainable Local Physical and Land-Use Development Plans of the contextual urban centres connected by the C97 that sustains their very existence.

1.7 Scope of The Study

This study focuses on two main issues, that is trade and movement of food through the supply chain and the socio-economic development of the market centres and sources of production as a consequence of these activities. The scope is further broken down into more detail for rational interrogation.

1.7.1 Substantive Scope

Periodic markets as nodes of food trade and territorial development. This looks at the role of periodic markets in economic growth, exchange and circulation of currency, as well as resultant development of rural hinterlands due to this socio-economic web. Settlement characteristics along Machakos-Kitui road.

This allows so the mapping of the market centres along the Machakos-Kitui road and the hierarchies in place which determine their development. It interacts with how the social and the physical environments interact to elevate the available developments as well as creating a strategy for future proposals.

Land-use typology along Machakos-Kitui road transportation corridor. This allows for the assessment of land-uses, the situation analysis and ground conditions; and how they currently impact and could possibly impact the markets in the study area.

1.7.2 Spatial Scope

The study focuses on one periodic market circuit, which exists along Machakos-Kitui highway in Machakos county. This circuit comprises related markets which are in operation year-round to feed the rural hinterlands and are operational 4no. days a week. The markets in this study include: **Masii food and livestock markets, Wamūnyū farmers market and Katangi farmers' market**. Due to its key role in supply for smaller markets in the region, **Kaseve 'informal' wholesale market** is added onto the list, as it is perceived to play a key role in the supply chain.

The transport corridor on which the markets reside, the Machakos-Kitui highway, is a vital intercounty road that connects Machakos county headquarters to Kitui county headquarters while also providing connection to the Makueni county through intersections at Kĩthangathĩnĩ and in Masii town. It provides the main point of access to the economic backbone of the south-eastern Kenya by provision of both direct and indirect linkage for major markets in Machakos, Kitui and Makueni counties. The importance of the highway to the region is objectively unsurmountable, as the very existence of these markets is dependent on the road. Access provided by the road network allows for the rural hinterland to benefit from the periodic markets, from specific markets within the circuit and also from secondary markets created as a result of the primary periodic market circuit. Therefore, as a delineating factor, the spatial scope of the study area is on the linear orientation of the Machakos-Kitui road from Kaseve market centre to Katangi market centre; with nodal focus on the aforementioned markets situated along the road.

1.8 Limitations of The Study

Political disruption and civil distrust. Due to the timing of the data collection, the study coincides with the national electioneering season, making data collection a sensitive endeavour. Accessing the public may be faced with mistrust, as such prior introduction may be necessary, impeding the time available for the data collection process, necessitating the use of technological alternatives.

1.9 Operational Terms

This is used to define the terms used in the study as per the contextualised interpretation of the study.

Farmers markets: are markets where local farmers, growers and producers sell their produce directly to the public

Farmer-trader: is a farmer who seasonally participates in periodic farmers markets upon harvesting of agricultural output, for the purpose of seasonal trade and/or economic enterprise.

Food trade: is the commercialisation of agricultural output, which is considered consumable food, be it in the form of: raw output, value-added or processed agro-industrial produce.

Periodic farmers markets: are market centres that are used to avail a means for trade of commodities and services by both individuals and groups in locations designated for periodic trade on specified days of the week. This includes farmers, traders, farmer-traders and brokers.

Rural hinterlands: are rural areas which is economically tied to an urban catchment area, defined by connection and direct relationship as a consequence of road network or administrative piggybacking.

Settlement nodes: are organised groups of people living in the same region due to a causative entity which can refer to trade, employment, industry or familial ties.

Territorial development: is designated development that is endogenous and spatially integrated, which leverages the contribution of actors operating at multiple scales and brings incremental value to national development efforts. It refers to integrated multi-sector development across a specific portion of territory, guided by a spatial vision of a desirable future and supported by strategic investment in physical infrastructure and environmental management.

Transportation corridor: is a designated set of routes within the national transportation network which can be used for the distribution of goods and services throughout the country. It comprises nodes and links for the various available modes of transport connecting various means and different service areas.

1.10 Outline of The Research Project

The thesis is organised in six comprehensive chapters.

Chapter One: Introduction: introduces the study. It discusses the research problem, the intended objectives of the study, the scope, assumptions and limitations to the study. It gives an overview of the expectations, findings and underpinnings of both the research and study area

Chapter Two: Research Methodology: focusses on the research methods used, the research design, the research approach as well as the situ are discussed in this chapter. The sampling techniques, validity and reliability of the study are alluded to in this study.

Chapter Three: Literature Review: focusses on existing literature on urban-rural linkages; food security in both urban and rural settings; background information on historical accounts of periodic markets in Kenya, Africa and the world; value-chain studies on food and the economic dynamics of agricultural regions; global trends on farmers markets and periodic markets; and the economies of scale. It tackles the farm to plate dynamics citing the periodic markets as catalysts for socio-economic vibrancy in agro-ecological zones. The secondary data facilitates the creation of a conceptual framework, giving highlights on the backbone of the research. This chapter also enables the generation of viable theoretical framework with the aim of creating a balanced system that characteristically defines reason and the thought process behind the grounding of this study in the field of urban and regional planning.

Precedent and Case Studies on matters on urban-rural linkages; sustainable periodic markets; market design and economic suitability of market centres and how they marsh up with the study are also discussed in this chapter. This section interrogates existing cases of similar or elevated character of relevance in deriving a sustainable way forward for planning for periodic markets.

Chapter Four: Study Area: expounds on the research situs for the project, giving a brief description of the study area for context.

Chapter Five: Data Analysis: addresses the analysis of data collected from the field. The study culminates in bespoke recommendations on the subject matter. and how you have deduced its conclusion

Chapter Six: Summary of Findings, Conclusions and Recommendations - deductions obtained from the study are highlighted. Recommendations are made to suit various challenges encountered. Areas of further research are alluded to here.

CHAPTER TWO

RESEARCH METHODOLOGY AND DESIGN

2.0 Introduction

This study was set up to investigate the potential for farmers markets as nodes of food trade and territorial development, as well as the resultant influence on the growth of towns along transport corridors. The study area in this case was the periodic markets along the Machakos - Kitui highway within Machakos. The transitory nature of permanent and semi-permanent farmers markets, acquires inspiration in a system of linked socio-economic dependence based on shared market dominance, controlled competition and rational inclusion in trade and remittance in the rural hinterland through the markets.

The study area, although bespoke to its context and extraneous factors, can still be considered a typical example of the growing concept of periodic farmers markets all over Kenya. As such, the periodic market circuit was selected while considering various attributes: Firstly, the farmers markets along the Machakos-Kitui road transport corridor are among the most vital markets in Machakos County, a characteristic that holds true in relation to the adjacent Makueni and Kitui Counties as a consequence of access and proximity.

Secondly, the periodic farmers markets have each a unique reason for existence, purpose and intended audience, identity and type of trade. Thirdly, the periodic farmers markets offer diversity with regard to spatial characteristics, the definition of space, location and need matrices. And finally, the expansion of the Machakos-Kitui road and its direct and indirect impact on the road-side markets

The study interrogated various interconnected variables which bound rural and urban linkages through agro-economic enterprise, food security and the impacts on the local economies in the context of the study area. It also assessed the impacts that these farmers markets had on the resultant market centres, urban areas and rural townships. The methodology applied for this study comprised two major parts; **Primary research**: which was data obtained from analyses of data collection that was carried out using designated data collection tools; **Secondary research**: which involved the interrogation of existing literature on the subject matter, precedent cases on the context and relevant case studies.

The primary study was designed to collect context-specific data on the existing site situation, through comprehensive interrogation of the various aspects which merge to conceive the forces that drive the existence and co-existence of the markets in context. The exploratory nature of this study offered opportunities for diversity. The study, though specific to periodic farmers markets, is inadvertently linked to other sectors, whose involvement both directly and indirectly impacts said markets. As such, deemed necessary were the three stages of the study:

Reconnaissance was undertaken to obtain familiarity with the study area, and get a scope of the local dialect and the cultural norms. The Pilot Study carried out enabled the determination of the feasibility of the study, the relevance of the research instruments, and the scope and sampling techniques to be used. With confidence attained upon streamlining the research instruments and familiarization with the study area, **Primary data collection** was undertaken. This involved the administration of research instruments to the relevant respondents. The participants included and were not limited to the tenants of the markets, mobile retailers, transport-affiliated communities, owners of adjacent land, the local administration, administrative representatives from the national government at the local level, local authorities, market management authorities as well as cooperative leaders. It also included the investigation of the physical environment as a consequence of the existence of the markets. Additionally, it involved taking photographs, visual-audio recordings, free-hand sketches and Computer-Aided Design (CAD) generated studies. The study also involved conducting focus group discussions with relevant groups within the catchment area of the study. This worked to ensure the validity and reliability of both primary and secondary data initially collected. Observation techniques were also included.

Upon the completion of the primary data collection exercise and triangulation of the available secondary data obtained, where data analysis took place. The output from the first draft of the data analysis called for additional information necessitating the need for additional **Secondary data analysis**. This involved the analysis of secondary data obtained from stakeholders and interest-holders in the field. These included geo-data, data from local authorities and relevant sources affiliated with the context.

2.1 Research Design

The overall strategy used in this study was grounded on the premise of scientific inquiry, following a cyclic procedure. The nature of this study combined *causal-comparative research* with *correlational research*. Correlational research design is a non-experimental approach that puts two or more variables against each other using statistical data, to allow understanding, statistical analysis and impact variation on influences of extraneous variables. This research design was adopted in response to the unique relationships within the diverse parameters that drive the socio-economic and physical environments. The study took into account the existing situation on the ground in an attempt to provide systematic information about the study phenomenon. This research design was herein adopted due to a concept regarding asset mapping of resources, as well as socio-economic topography. Also referred to as a quasi-experimental study, *Causal-comparative research design* attempts to establish the cause-and-effect relationships among identified variables.



Figure 1: Research Process, source: www.flowmapp.com

However similar to experimental research, this research design differed slightly in that the researcher was not in direct contact with the research subjects, and neither manipulate data nor the content available for the desired output. Rather, the study involved observing the parameters around various socio-economic phenomena allowing them to unfold uninterrupted. This was done through the identification of control environments through select control groups exposed to a given phenomenon and an understanding of the defining parameters. This study oscillated around the socio-economical constructs that comprise the rural-urban linkage systems created by periodic markets. It was observed through the market system as a compact entity, the individual market centres as independent entities, and also the rural hinterlands complementary to the markets centres as the food baskets and source of resources that facilitate the entire process of trade and as the source of the human capital. The study can be broken down into eight functional units. The research problem was identified due to existing gaps in planning for food systems in rural areas, especially in the wake of the COVID-19 pandemic. This compelled the amassing of literature to identify similarities, potential solutions and implementation strategies for the subject matter. This included literature obtained from residents of the study area. The generation of objectives and research questions set the study in motion. Reconnaissance was undertaken for the purpose of choosing a study design as well as determining the sample needed. This also allowed for the testing of instruments made

prior to the primary data collection exercise. Data was collected, analysed and triangulated, with the continuous re-evaluation of secondary data available to ensure the reliability of the study. This report is a culmination of the process in its entirety, having undergone peer review and systematic interrogation by the project supervision team.

2.2 Description of The Study

The study was on periodic markets within Machakos County, with sample markets in Mwala Sub-County, Yatta Sub-County and Kathiani Sub-County. This draws from the interconnectivity of natural resources, financial and human capital as well as the resultant impact of this collective dependence on trade, economic development, distribution and recycling of capital within the local economy. This is while factoring in the resultant impacts on the rural hinterlands.

The primary data collection was split into three sub-sections. They were conducted independently due to contextual variation, time and purpose. First, **the pilot study** enabled the identification of the desired sample size. This helped give impetus to the study, create an understanding of the time schedules, adjust research instruments to consider any socio-cultural issues, appreciate the volume of expected output and the identification of the *modus operandi* of the study. Secondly, **the initial investigation** involved the administration of research instruments such as interviews, questionnaires, and the use of observation checklists, real-time surveys and virtual discussions. This stage involved a research team and participants from the selected areas, using the prescribed sampling criteria. Finally, **the follow-up investigation** involved focus group discussions, secondary key informant interviews and secondary surveys, which will act as a clean-up effort of the data collection exercise in an attempt to standardize and triangulate the data collected and also balance any missing information, verify any outliers and tie any loose ends.

2.3 Tools of Data Collection

Tools of data collection used for this study included: observation techniques; administration of instruments; use of focus group discussions and conducting of interviews.

2.3.1 Observation Techniques

Observation techniques contrast based on intent, context and desired content. They may require direct and/ or indirect approaches and have been used to interrogate both exploratory and experimental studies within the social and natural sciences. In this study, the use of simple observation was incorporated to allow for an unobtrusive analysis of phenomena and human interactions. This involved real-time systematic recording of data with great attention to time periods, so as to comprehensively derive a representative sample of reality. The use of cameras, visual-audio recordings and time-lapse photography were incorporated into the study, with care, so as to avoid instances that could compromise ethical considerations. So, consent was sort, where required.

2.3.1.1 The Physical Environment

This involved appraisal of the physical environment in both the built and natural context. It involved taking account of the elements of urban design and urban planning or lack thereof, with regard to the built environment and the resultant impact on the natural environment as a consequence of the same. It involved the use of trend analysis from previous and current aerial photographs availed by Google Earth, taking photographs of the current situation and collecting previous photographs of the same area. This also involved taking account of the influences of the built environment on social behaviour, economic capacity and potential growth. This incorporated use of records on climatic data, geographic data and hydrological data on the study area. Appreciating the geo-spatial transition put a lot of the discussions into perspective and grounded the output obtained.

2.3.1.2 The Social Environment

This included an appraisal of the socio-economic aspects of the study area through collective interrogation of variables affecting the said environment. In relation to the physical environment, this included taking account of various human interactions, the nature, calibre and forces driving said interactions. The resultant dynamics and evolution in relation to time, context and purpose were also considered. It involved direct interaction with study subjects and participants for a more realistic and candid experience in some inimitable instances. This included visits to various types of farms, interacting with farmers in the catchment areas, such as in Muthetheni, Vyulya, Miondoni and Masii, participating in the livestock trade markets, as well as interacting with market representatives.

2.3.2 Interviews

This encompassed the acquisition of user perception, direct appreciation of the study parameters and views on minute non-perceivable matters experienced by various participants. These included: key-informant interviews which shed light on the existing situation, assuaged unverified premises, clarify with the aid of objective valuable information and enabled the collection and analysis of meticulous comprehensive data. It allowed for a more comprehensive understanding of the study area and the derivation of facts. The interviews were administered using interview schedules in appendices 13-16 to representatives of the local authorities, the public health department, the sub-county veterinary department, the forestry department, the physical planning department, the education department, the social services department, the agricultural and extension service department, the business community, the markets associations, farmers associations, the transport sector, traders and consumers within and around the study area and its regional catchment.

2.3.3 Administration of Instruments

Referred to as a set of activities which comprise the collection, processing, storage and dissemination of statistical data from one or numerous sources, this exercise consisted of the administration of questionnaires to various individuals within the study area.

2.3.3.1 Questionnaires

Administration of questionnaires involved the timely acquisition of data for purposes of quantitative analysis and it was done with the aid of vetted research assistants. This included both physical questionnaires as shown in appendices 10-12 and a virtual survey done using KoBoCollect distributed to a catchment of 3,000 participants on existing farmers' social media groups. The survey was intended for short-span responses based on opinions on selected variables. They were administered for the purpose of understanding trends, user perception and spatial distribution. Administration of questionnaires was done to traders, farmers, farmer-traders, transporters, middlemen as well as consumers. The data derived was based on an analysis of the initial study through interviews, in a bid to seek clarity from participants.

2.3.4 Focus Group Discussions

The involvement of a collective thought-process through discussions allows for clarification of previously misunderstood or indistinct content. Collective thought brought about by participating in a public forum for a shared interest makes focus group discussions a staple for comprehensive analysis in social sciences. As such the focus group discussions were incorporated at the final stage of the study, where previously collected data bearing uncertainty was discussed and reviewed. The discussions were aided by a focus groups discussion guide shown in appendix 17, and they were held and moderated with the involvement of three research assistants for diversity of views and experiences, coordination and comparison of notes taken. The participants included farmers, traders, consumers, and transporters. The discussions covered the combined and divergent experiences, knowledge and biases, which were readily recorded, with consent from the participants using the introduction letter in appendix 1. This was intended to broaden the spectrum of thought and fill any gaps noticed through the data collection process.

2.4 Sampling Procedure

The study used a combination of sampling techniques during data collection.

2.4.1 Cluster Sampling

Primarily, cluster sampling was used for the selection of market centres. These centres acted as clusters, in which the participants of the market days were considered representative of the population. The study used three clusters: Masii township, Wamũnyũ market centre and Katangi market centre for the collection of data concerning the business enterprise in the periodic market circuit.

2.4.2 Simple Random Sampling

Secondly, Simple random sampling was adopted in the data collection. This was in the effort to acquire objective data devoid of bias on people who used, inhabited and participated in the day-to-day activities within the study area. This was while considering constant movement as one of the standard *modus operandi* of any market centre. This applied to the traders, consumers, transport operators, middlemen and security personnel.

2.4.3 Multi-Stage Sampling

Multi-stage sampling was then used in the collection of consumer and household data. This was done while taking into account the hostile political environment during the electioneering period and the national fuel shortage which sparked an economic crisis and severe transport deadlocks. As such a stratified sampling system was utilised in this study. Firstly, **cluster sampling** was used to identify farmers, who were instrumental in the divergence of household data in selected locales; and then the general population was sampled for consumer data. Secondly, the use of **online surveys** allowed for real-time data collection, using *KoBoCollect*. This resulted in the assumption of **voluntary sampling**, where the participants chose whether or not to contribute to the survey.

2.4.4 Purposive Sampling

Purposive or Judgemental sampling was incorporated into data collection from key informants. This was vital as it required the identification of key players in a field and obtaining directly data from them. These participants included officers in the departments of physical planning, veterinary services, internal security, administration, forestry, livestock and crop production, and social services. The key informants were selected in accordance with their field of expertise, niche and requirements as per the data-need checklist.

2.5 Research Methods for Objective 1: Impact of the Periodic Markets on Development

This was in order to analyse impacts of periodic farmers markets on the development of their contextual setting. It was intended to examine the influences that the selected periodic farmers markets had on their locational context. It included understanding the rationale behind the existence of the periodic farmers markets and how they co-existed within their neighbourhoods. It involved analysis of push and pull factors attributed to the location of these markets as well as the forces that drove their sustenance. This attempted to rationalise what sustained these markets; how they were serviced and replenished; their spatial and volumetric needs; location choice; impacts on growth and/or decay of neighbourhoods, the interconnected market centres; as well as sustainability indices of the markets as parts of a periodic market circuit.

2.5.1 Research Methods for Objective 2: The Contribution of Periodic Farmers Markets to The Local Economy

The study endeavoured in assessing the contribution of periodic farmers markets to the local economy. This prompted understanding on economic contributions of periodic farmers markets to the local economy. This comprised the natural resources, human capital and financial injections into the markets through the food systems as well as activities of trade within the market centres. It included the capacity for recycling currency, contribution to local government revenue, as well as injection of external proceeds into the local economy by the activities of trade. It prompted the analysis of the economic input of periodic farmers markets to the local economy as points of trade, sources of external revenue and with an impetus for development. This was aimed at the evaluation of economic capacity, viability and potential for the periodic farmers markets in their geographical context. It meant appraising the flow of goods and services, revenue and resources as well as human capital flows. This also involved the interrogation of periodic farmers markets as economic hubs, points of trade and multi-faceted nodal elements of trade and commerce.

2.5.2 Research Methods for Objective 3: Periodic Farmers Markets Interventions for Resilient Rural-Urban Linkages in a Post-Pandemic Era

This study went out to evaluate periodic farmers markets interventions for resilient rural-urban linkages in a post-pandemic era. It was done in order to address the responses accorded by users of the periodic farmers market in the wake of the COVID-19 pandemic. It internalised the conditions brought out during the supply-chain disruptions caused by the subsequent lockdowns during the pandemic and the adaptive strategies put in place to circumvent the unique resultant conditions. This was in an attempt to review the conditions set for resilience in urban areas, while also endeavouring to analyse the interactive relationships in urban-rural linkages in a post-pandemic era.

2.5.3 Research Methods for Objective 4: Planning Interventions for Periodic Farmers Markets on Spatial Use

The study made attempts at proposing planning interventions for periodic farmers markets on spatial use. This was so as to enable an understanding of the physical contribution of periodic farmers markets to adjacent land. It examined resultant land-uses as a consequence of the existence of these farmers markets as either complimentary, support or tertiary to periodic farmers markets. This included developments which influenced and/ or were influenced by the location of the periodic farmers markets. This aimed at validating the interrelationships between periodic farmers markets and adjacent land uses, conditions supporting their co-existence and factors which promoted the growth of both the farmers markets and adjacent land. Such included transport infrastructure which facilitated access, circulation and mobility within and around the markets; social and civil amenities as well as the sustainability of said markets.

It was also an attempt to evaluate the periodic farmers markets as elements of the built environment. It involved the interrogation of spatial planning, market design and management services. It included the evaluation of market functionality, usability, user-friendliness, user perception, accessibility, mobility and circulation. It prompted the interrogation of design elements for safety, efficiency and the sustainable utility of the markets as provided for, as well the spill-over effects into the direct environs. This study aimed at assessing the impacts of planning or lack thereof for periodic farmers' markets, as both independent entities and transitory elements of rural planning. It involved the examination of the spatial needs of periodic farmers markets, the investigation of the ideal requirements for sustainable periodic farmers markets and how these elements could be incorporated into sustainable market design.

2.6 Conceptual Framework

In a bid to illustrate the relationship between the study variables, a conceptual framework was generated. It defined the objectives for the study through the interconnection of socio-economic nodes that touch on the study theme and contextual area within the current situation. It earmarks the significant placement of asset mapping for farmers markets as well as socio-economic mapping and resource topography for the achievement of sustainable growth of market centres and urban areas. The multilateral linkages expressed through the arrow movement expounds, rather than delinks related elements. The framework allows for the visualisation of cause-and-effect relationships, through the identification of other influencing variables as in the case of the change in land use, food security, preservation of farmlands and propagation of rural livelihoods as well as the positioning of sustainable rural-urban linkages.

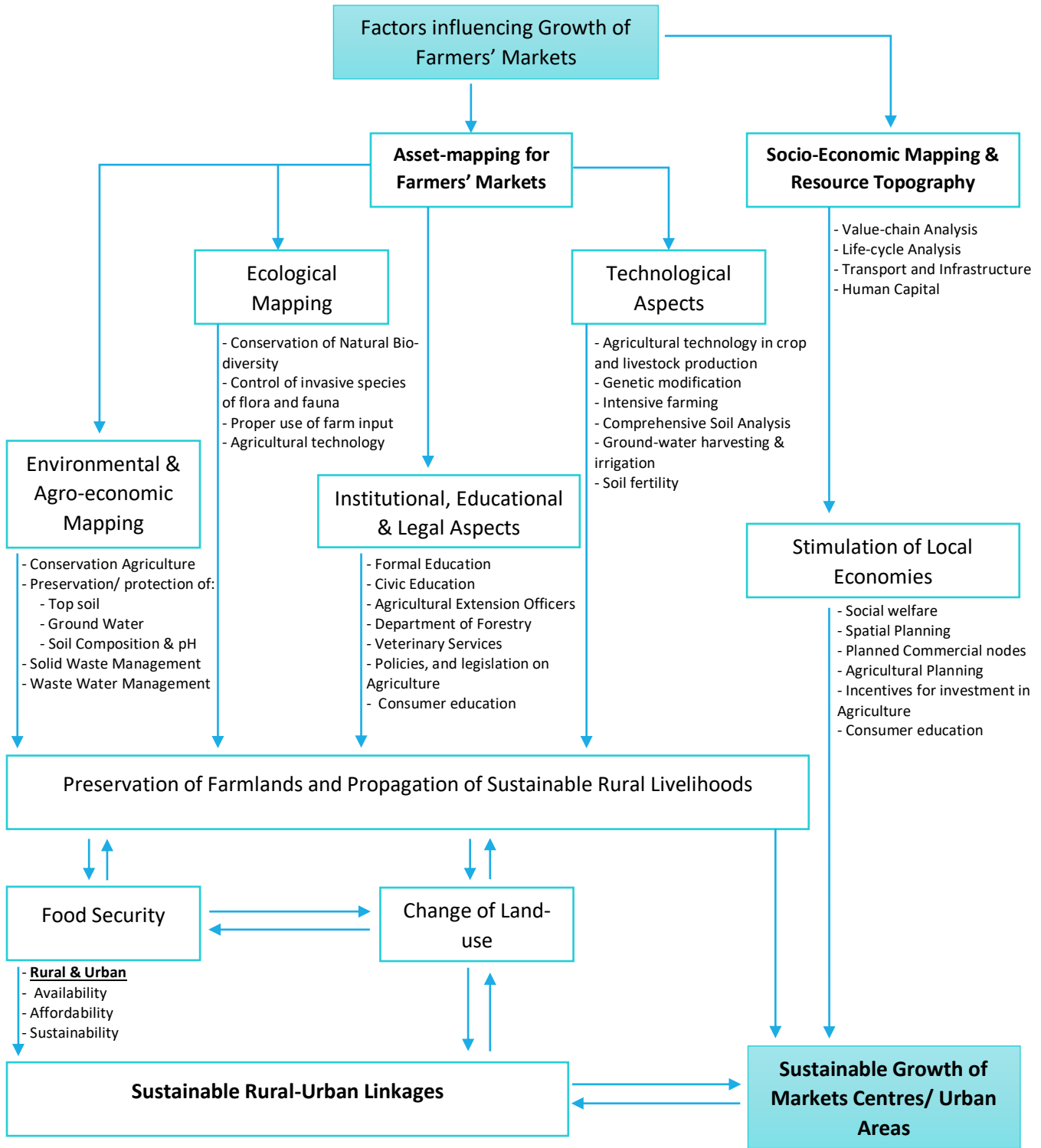


Figure 2: Conceptual Framework

2.7 Data Analysis and Presentation

Data analysis primarily involved the use of computer software, namely: SPSS, KoBoCollect, Microsoft Excel and Microsoft Word. It was done in three segments:

2.7.1 Open Coding

This initial stage involved the identification of distinct categories and concepts in the datasets which would constitute basic units of analysis. Data was broken down into various distinct concepts which would produce headings and subheadings depending on the objectives discussed and the methods and techniques used. Data from the questionnaires was coded depending on the expected output and a data sheet was provided for the purpose of analysis. This was done to allow for new theoretical possibilities as the data collected significantly exceeded expectations. Open coding was also done on the field notes and data from the focus group discussions due to their raw nature and their ability to enhance efficiency during tabulation and secondary analysis. The discussions promulgated were used to argue the derived deductions.

2.7.2 Axial Coding

This primarily focussed on the text defined by the conceptual framework. The information processed was reviewed to ascertain whether the interrogation of categories used, such as food security, asset mapping, resource topography, etc. was an accurate representation of the data collected from the field. The text was cross-checked and a theme was set to regulate any secondary adjustments, allowing for easy review. The codes generated in the axial coding were herein categorised.

2.7.3 Core Coding

This involved the compilation of the categories previously created through axial coding. It involved data entry into the SPSS software, where both qualitative and quantitative data were fed into the program. This was done to represent the central thesis of the research. The data set generated through the exercise was done in an iterative manner for quality assurance purposes. The codes were corrected, adjusted and checked for errors before the data was analysed and tabulated.

2.7.4 Tabulation

Finally, tables were generated from the data analysed using SPSS. These tables were then used for the generation of graphical information through MS Excel, and then translated to MS Word for the purpose of this report. This was done in a bid to easily explain the final concepts and derived data. Major categories, depending on the headings and subheadings being discussed, were produced to display collated information. This was done for the effective organisation of discussions and subsequent analyses of hypotheses being applied. Graphs and pie-charts were generated from these table to expound on various data sets and also for palatability of the report through graphical presentation.

2.8 Ethical Consideration

The issue of ethical practice in the research process is context specific. In this study, consideration was made for issues with language, personal association, communication, physical interaction and even body language. Therefore, to assuage the occurrence of misunderstandings, the pilot study was carried out with the aim to iron out possible misconceptions prior to the primary data collection. This was intended to avoid incidents that may have resulted in disruptions to the study. The exercise included the selection of research assistants with native knowledge of the subject area, cultural norms and local dialect. During primary data collection, confidentiality was maintained at all times to ensure the protection of privacy for both the researchers and the participants. This aided the streamlining of the study sans bias, and it offered confidence to the participants. This went hand-in-hand with the regulation of tone in the research instruments administered, the use of audio-visual recordings and the taking of photographs. Use of recorded material, prior to recording was subject to consent.

2.9 Conclusion

The study was meant to unravel the outstanding assumptions and hypotheses on the impacts of periodic farmers markets on territorial development. This goes hand-in-hand with appraising sustainable socio-economic dynamics and how they enhanced rural economic growth aided by market centres. Also, the study endeavoured to comprehend how sustainability could be imbued in the growth and development of market centres in rural areas. This study interrogated urban-rural linkages through a critical lens and drew conclusions through the relatibility of the parameters and the relationship of the variables selected.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

While much of the literature on forms of exchange and circulation has focused on the stretching out of economic and social networks in a global and neoliberal context, and the power of corporate capital wielded through these networks, there has been a turn more recently to consider forms of exchange and circulation that present alternatives to these global capitalist networks (Hughes, 2005). The economic value of the environment is as real a concept as the socio-cultural influence of the geographical context on its economy. In the search for food, humanity, unlike any other inhabiting species on the planet, has successfully distorted the capacity for ecological replenishment of major ecosystems worldwide, to previously feared extents of mass extinction of flora and fauna. However, human populations grow consistently and as such, the need arises for comprehensive intervention.

With the increase in population, Agriculture is forced to grow to meet the increasing demands. This has become an uphill challenge for many regions, currently experiencing adverse effects of climate change which alter the composition of the agricultural capacity and output of these areas. While novel ideas enter the arena in the name of technological advancement and *Glocalisation*⁶, a lot is left to be desired, as food remains, fundamentally a consequence of nature or natural production, for the time being at least.

Considered a major source of livelihood in Machakos county, agriculture employs approximately 73% of the population and contributes to 70% of the household incomes in the county⁷. This considered, issues stemming from climate change and poor planning create impediments in the agriculture sector, endanger local livelihoods and threaten food security. While off-farm services such as climate data and market information, extension services and access to credit services are offered by various institutions for enhancement of the adaptive capacity; inadequate finances, detrimental ‘traditional’ practices, and inefficient markets and market systems are major impediments to the adoption of new agricultural technology (MoALF, 2018). The unsustainable dependence on rain-fed agriculture during the current climatically unstable time further expedites the already dire situation.

⁶ *Glocalisation* – is the concurrent existence of both contextual and universal predispositions in economic, social and political systems. It is often elaborated using the phrase, ‘think global, act local’ from whence the name is derived.

⁷ <https://ccaf.cgiar.org/resources/publications/kenya-county-climate-risk-profile-machakos-county-kenya-county-climate-risk-profile>

3.1 Trends for Periodic Farmers Markets

Over time, some markets decline, and even ultimately die, as newer markets emerge and, if conditions prove conducive, eventually flourish. Meanwhile, larger roadside and peri-urban markets may even become so successful as to transform from periodic to daily markets. The rapid expansion of urban populations exerts continuous pressure on Africa's traditional food supply systems (Porter, 2005). This evolution is characteristic of the food trade, and it carries with it significantly impacts on the regions served. Food systems throughout the world flourish as a consequence of need, proximity, knowledge and culture. These factors control market demand, consumer preferences and even agricultural practices responding to ongoing trends. They curtail the limits to which a market thrives or decays, as a result. Periodic market importance in the supply chain, especially in ASAL areas, can neither be understated nor ignored. They sustain rural livelihoods, by providing an avenue for the disposal of surplus produce, generating linkages between rural producers and urban consumers, as well as introducing unique regional rural connections through the exchange of goods, resources and human capital.

Provisions for markets, however, remain a sore planning point in Kenya, with the designation of markets still an afterthought of development post-urbanisation. Periodic markets more so as their very existence remain a bone of contention due to their haphazard existence, uncontrolled evolution as well as minimal political goodwill in their formalization. This systemic distortion stems from as deep within the planning discipline as can be seen engrained in the Kenya Physical Planning Handbook (2002). The Handbook grossly misrepresents markets as land masses with an arbitrary population catchment, limited physical area and with insufficient auxiliary facilities. The idealisation of markets as daily markets with neither specification of need, nor special ergonomic consideration puts the entire planning process for periodic markets at an impasse. Herein, markets are only viewed as static land masses, negating the possibility of the very deviation which sees to the existence of periodic markets. There are five categories of markets according to the Planning Handbook. **Category A** markets are fenced with a central refuse collection point occupying 0.05-0.2hectares with a perceived catchment population of 2,000 low-income, in suburban areas; **Category B** markets refer to a fenced area of land with a central refuse disposal point, central water point and water closet, occupying 0.2-0.25hectares; **Category C** refers to a walled-in land mass with cluster collection points, central water points, hardstanding plots, and water closet. This is to include hardstanding surfaces, fixed stalls and divisions, all occupying 0.2-0.28hectares; **Category D** refers to a walled-in area with grouped refuse collection points, hardstanding plots, central water points and water closets. This is to include hardstanding surfaces, fixed stalls and divisions, all occupying 0.2-0.28hectares; and finally, **Category E** describes a covered market of 0.2-0.3hectares (GoK, 2002). The attribute of being enclosed within a fence or walled grounds is however impractical in the current Kenyan

situation as the increased population supersedes the already inadequate provisions given. The intricacies of scale, supply, and dynamic consumerism render the characterisations of markets archaic and in dire need of revision.

3.2 **Genius Loci⁸ of Periodic Farmers Markets**

The foundation of such a study would be from the supply front, the producers. It involves the identification of the main production areas for key crops and their handling characteristics, the modes of transport used, considering trends, observing past growth and the potential for enhanced production. Subsequently, the physical facilities which sustain this network of linkages are reviewed, including communications, the intermediate markets and supplementary infrastructure which facilitate linkages. Produce flows to local, city and regional markets are subsequently assessed and an appraisal of the infrastructure requirements is undertaken to meet future demand emanating from urban areas. Finally, the implications of transport improvements on market linkages are reviewed (White, 2005). Environmental benefits attributed to the proximity of farmers markets to their intended consumers can therein be evaluated. Farmers markets create a unique bridge which reduces the distance between the producers and consumers as is evident with connections between sources of food from local farmers and growers and the intended market. The reduced movement mitigates issues of elongated transportation, which decreases environmental pollution attributed to the movement. This helps decrease the amount of food waste generated as a result of produce damage during transit as well as cut down on expenses to farmers on the preservation of produce over long distances over time, especially perishable agricultural produce which requires secondary and/or artificial temperature control, etc. (Trobe, 2008)

3.3 **Food Security**

Food security can be defined as a measure of food availability and the ability of every individual to access it. **Food Security** exists when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food which meets their dietary needs and food preference for an active and healthy life (*The United Nations Committee on World Food Security - World Food Summit, 1996*). **Food insecurity** on the other hand exists when people lack adequate physical, social or economic access to food as defined. According to FAO, **sub-nutrition**, often assumed in official literature as being synonymous with the more emotive term, *hunger*, results from the intake of food that is incessantly inadequate to meet standard dietary caloric requirements. While measurements are typically derived from national income distribution, food balance sheets and comprehensive consumer expenditure data, linking

⁸ **Genius Loci** – refers to as the spirit of a place. The term elucidates how every ‘place’ (note: *not to be confused with ‘space’*) carries its own set of unique qualities, in terms of how it is perceived, its physical characteristics, the push and pull factors that define its existence as well as its bespoke socio-cultural attributes. It is therefore very important for designers in the built environment to address these areas with a manner of sensitivity that enhances their value rather than prompt their destruction.

hunger and sub-nutrition to inadequate food intakes allows for measurement of food insecurity in terms of availability and apparent consumption of staple foods or energy intakes (FAO, 2002).

A succession of alarming events, including global economic crises, excessive food price volatility, related weather shocks and climate change, threaten food production (Leroy, Ruel, Frongillo, Harris, & Ballard, 2015). Additionally, with the geo-political instability due to current ongoing wars in the global north, the COVID-19 pandemic and the resultant severing of vital agricultural production and output supply chains, food security is a top priority for governments and the global development community. Recent years have seen an increase in the number of discussions around means of feeding the rapidly growing global population. Alongside this has evolved a need for awareness and an improved understanding of scales and measures for food security.

Inequalities in food access highlight that the experience of living in poorer communities is vastly different from the experience of living in more affluent ones and that these variances can even lead to increased death. However, their ability to highlight these disparities often leads to a public response that focuses only on food stores themselves, rather than a broader focus on the wider inequalities in socio-economic investment, political and economic power, and health that the **food desert** issue highlights (Block, Chavez, Allen, & Ramirez, 2011). Originating from a community articulation of food system injustice, the food desert concept has seen to policy trajectory marking an erasure of community involvement and agency. Many studies in this field attempt to steer people and communities towards their being more in control of their food procurement, be it growing food within the community or providing purchasing alternatives in areas with few (Block, Chavez, Allen, & Ramirez, 2011)

Anderson (2008) attempts a solution for Economic, Social and Cultural Rights (ESCR) by setting up a criterion for comprehensive address to rights-based food systems (RBFS). He breaks them down into six categories which include: First, the absence of human exploitation in the food production process; secondly, the democratic decision-making on food system choices that have an impact on people more than a sector of the system, for example, consumers and producers, or distributors and producers; thirdly, fair, transparent access by producers to all necessary resources for food production, including knowledge and the pre-requisite skillsets for task accomplishment; fourth, multiple independent buyers; fifth, the absence of resource exploitation; and finally, no impingement on the ability of people in other locales to meet these criteria for example, through trade relationships that undermine decent wages, fair prices, environmental quality, and transparency of access to information in other counties and countries. This asserts the multifaceted sectoral involvement of food in communities and the multiple roles put across for the various actors to accomplish. The diversity of needs brings to attention the need for public awareness and participation in the policy-making process of food systems. While it is important to acknowledge that

individual retail consumers are diverse and are often unconscious of their cumulative influence: they can be poorly organised, and externally more so due to the socio-political influence on food. The individual consumers are then left to carry most of the health costs of the current food supply, yet they are made responsible for their own diet-related (ill) health since they are ultimately accountable for what they eat (Lang & Heasman, 2015)

Various approaches to food system reform strengthen existing links between different sectors of the food supply chain or create new linkages within a relatively small geographic area, from multi-community to multi-state. ‘Local’ and ‘community-based’ are sometimes used as if to mean the same thing, but there are important differences. ‘Community-based’ is used to refer to the control over the food system by residents of a community, while ‘local’ simply refers to its geographic scope. A community-based food system might source food from outside the geographic region if community actors decide to. When communities choose to exert more control over their food systems, they usually opt for more local sourcing because of multiple benefits to the environment, the community, and farmers from increasing the amount of food consumed that is produced locally. Food is indisputably an important aspect of culture, and many traditional foods and foodways are healthier than foods consumed and advertised widely. The right to enjoy one’s culture and participate in cultural life by consuming traditional foods is threatened subtly. For instance, while an immigrant household might be able to obtain ingredients for traditional foods in an urban area, its children are susceptible to peer pressure and heavy advertising of processed and fast foods and may reject traditional foodways in an attempt to fit into the dominant culture (Anderson, 2008). This brings to light the justification for identity and freedom of choice in the provision of food options, which is often under threat as a consequence of food deserts in both rural and urban areas, consumer trends which motivate demand and supply dynamics, or socio-cultural erosion due to limited choices. While there are culinary, environmental, and homeland security arguments for eating locally, local production does not guarantee ethical production, and the conflation of ‘local’ with ‘good’ takes attention away from structural issues present in the global food system at large (Anderson, 2008). This increased control allows communities to shorten supply chains, demand better accountability from all actors in the food production and supply system as well as allow for multiple independent buyers and large-scale consumers.

3.3.1 Indicators of Food Security

Derived from Organisation for Economic Co-operation and Development, OECD and the United Nations Committee on World Food Security, indicators of food security converge as a combination of four criteria: **availability**, **access**, **utilization**, and **stability**. To capture the trends in variables that are likely to reflect food security, it is possible to broadly categorise them into two interrelated sets: those that directly

measure shortfalls in consumption requirements, and those concerned with the potential to meet such shortfalls (FAO, 2002). These are clustered into various levels based on a spatial hierarchy, presenting them in terms of geospatial/ population capsules as in global, regional, national, local, neighbourhood, homestead and individual.

Food security can further be conferred using contextual components, such as quantity, quality, safety, cultural acceptability, and preference. These allow for a community-based assessment which enlightens on the extent to which food security can be achieved or how imbalance can be addressed. These conditions are considered alongside contextual indicators that examine: household income/ expenditure, food consumption, home production of food, availability of trade centres and market distance.

Household food security

The ability to ensure adequate food security hinges on the ability to identify vulnerable households. Vulnerability encompasses a broad spectrum of factors which place people at risk of becoming food insecure. The degree of vulnerability of an individual, household or group of persons could be determined by their exposure to the risk factors and their ability to cope with or withstand stressful situations (FAO, 2002). Vulnerable households constitute three groups: First, households with circumstantial vulnerability, for instance; where available adults are incapable of providing a serviceable livelihood for the household due to reasons stemming from disability, age, illness and various other characteristics; secondly, households that lack sufficient resource endowment to provide significant income from available sources; and third, households whose resources and characteristics render them potentially vulnerable as a consequence of economic and/ or social shocks. Such would include distortions created by economic policies, fluctuation of consumer prices and resources necessary for production, such as fuel, fertilizer, genetic material for breeding and, seeds, to state but a few.

While it could be considered difficult to comprehensively define 'vulnerability', an important proxy to use in the identification of vulnerable households would be a standard socio-economic scale using an established criterion, such as the **poverty line**. This should then be accompanied by defining household characteristics (FAO, 2002). Such as **Location**: rural/ urban; small/ large village; remoteness; proximity to a large town/ urban area; **Composition**: male/ female head; age; dependency ratios; household size; **Source of income**: employment; production; trade; remittance; and other external transfers.

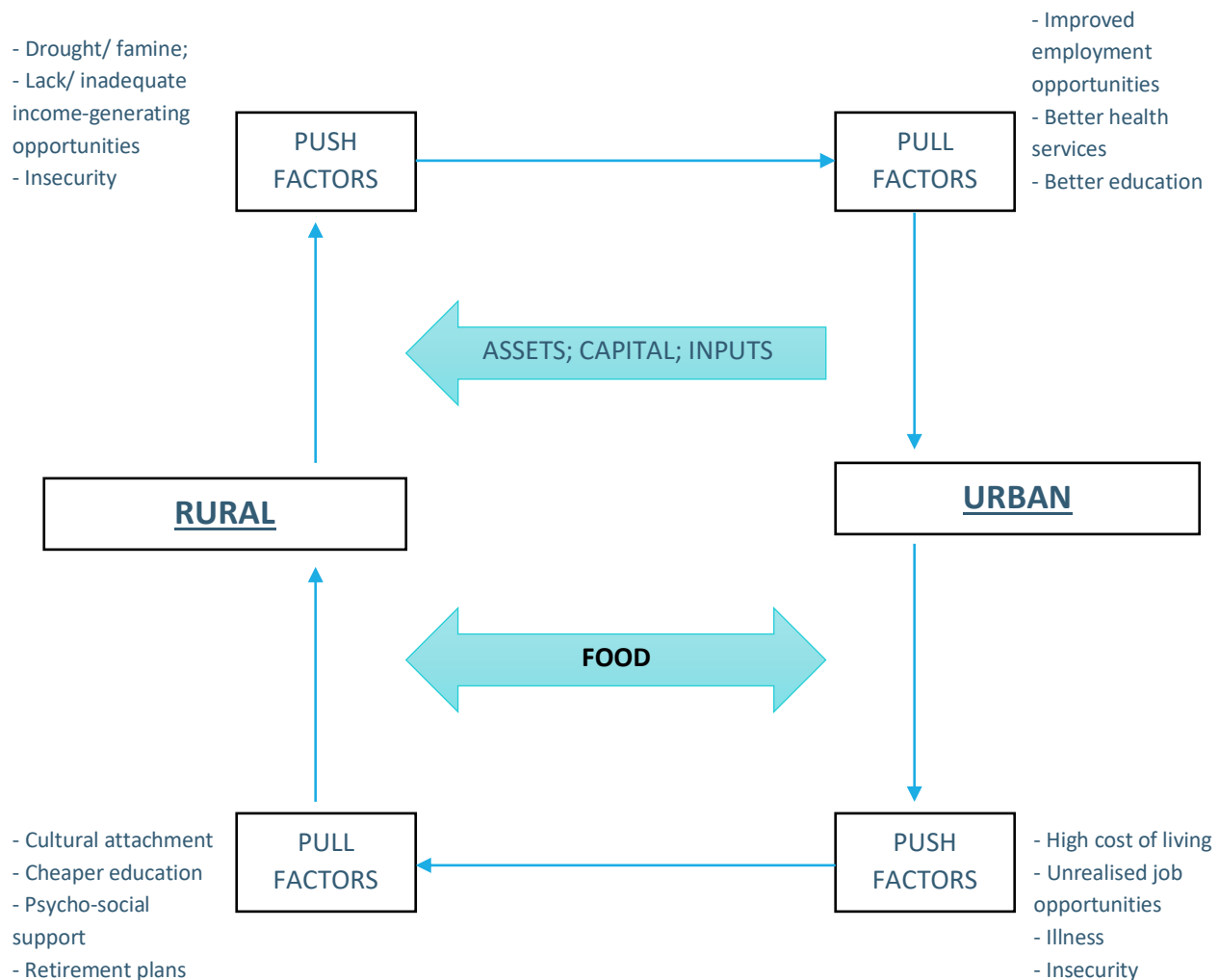


Figure 3: Vector dynamics in Rural-Urban fringes that influence food security

These fundamental factors stimulate the push-and-pull factors which contribute to rural-urban migration, rural depopulation, regional marginalisation and food desert creation. As illustrated in figure 3 above, the socio-cultural dynamics at play at the expense of food security comprise

3.4 Food Deserts

The Centres for Disease Control and Prevention (CDC) describes food deserts are areas which lack access to vegetables, fruits, whole grains, milk and other foods which constitute the full range of a healthy diet. Access, being the key variable, can be impaired or constrained by various factors, such as income, location, time, and the ability to travel to a store⁹. Food deserts are a consequence of various underlying issues. Such would include: **accessibility** to healthy food sources within an area featuring proximity to healthy food sources; **individual barriers** from personal restrictions which prevent access to healthy food including the adequacy of time to schedule purchase of food and inadequate funds to procure food;

⁹ What Is a Food Desert? Causes, Statistics, & Resources | Ohio University – www.onlinemasters.ohio.edu/food-deserts-definition

neighbourhood indicators which are characterised by reliability and abundance of public transportation, the average socio-economic conditions, neighbourhood incomes and purchasing power of the population. The capacity to produce food in the Kenyan context creates a unique situation for the food desert phenomenon. Issues of invasive food staples, high ecological dependency ratios, limited alternatives and local availability provoke the inaccessibility to sustainable food systems to glaring proportions. The different agro-ecological zones in Kenya also play a significant role in the creation of food deserts. While it is unfortunate that colonial interference still plays a key role in food systems to date, these ‘borrowed’ staple foods transcend generations into what a majority of Kenya ironically considers ‘traditional’ food. It stands to reason that some areas remain more marginalised and even strategically so, as they lack the propensity to produce the very food which comprises over 50% of their basic diet. That includes milk, maize, wheat, potatoes, beans and bananas. These products require space, bespoke climatic conditions and soil characteristics as well as a significant input in production, factors that are growing increasingly unstable in Kenya. The World Bank collection of development indicators reports that Kenya currently only carries 10.19% of arable land¹⁰. Considering the land mass, the climate, current agricultural capacity, and cash crop versus food crop conflict, among a host of colourful limitations, that is a horrifying reality, in the wake of the constant changes in land use, land fragmentation and rapid population growth.

Having acquired substantial traction in the global North, the concept behind addressing food security through the eradication of food deserts, through the supplementary provision of large outlets such as supermarkets has been gaining a foothold in African cities. In Kenya for instance, Vision 2030 alludes to an inclination to increase the market share of produce vended via ‘formal channels’ in an effort to enhance the country’s marketing system (Battersby, 2018). This notion presages awareness of both rural and urban food deserts. While convenience and accessibility constitute a significant component of food security, it is important to understand that inadequacy as a result of poor and/ or lack of access can result in the existence of food deserts. Transport infrastructure carries a significant burden on the socio-economic capacity of markets, food supply and distribution the world over. This signifies the pivotal role assumed by the markets in relation to the transport corridors. In rural areas especially, the importance of periodic markets to the rural hinterlands, and the subsequent connection to the urban areas cannot be overstated. These urban-rural linkages aid in the penetration of resources, food produce and human capital throughout the country’s backyard. It is however important to note that disproportionate allocation of the aforementioned can result in the formation of food deserts, which this study breaks down into **Rural food deserts** and **Urban food deserts**.

¹⁰ <https://data.worldbank.org>

3.5 Rural-Urban Linkages Through Food Trade

Rural-urban linkages are characterised by the movement of goods and services from urban to rural areas as well as from rural to urban areas. This is to mean that while rural areas are perceived to be a market for goods and services produced in urban areas; urban areas are considered an outlet for production from rural hinterlands. The dual sub-systems of supply and demand stimulate forward-backwards interactions based on both unilateral and bilateral production-function relationships. Sources of inputs, technologies required, human capital, intellectual capital and innovation, means of transport, physical space, telecommunication, institutional involvement, etc, operate in a cyclic nature within the dual sub-system which prompts this interdependence.

3.5.1 Physical Linkages

Physical infrastructure in terms of road and rail access has been the basis for both positive and negative economic development since the colonial era. Intentional marginalization created utilitarian systems for survival rather than for development. As such, numerous rural populations in Kenya, devoid of isolation, can be considered to have reverted to a pre-colonial setting with a semblance of autonomy. With the onset of devolution and the ongoing expansion of rail and road networks, these hidden gems are rediscovered and re-invented to fit in the framework of current developing systems. The resultant intrusion as a consequence of physical accessibility and provision of infrastructure propels the assumption of a unique food systems dynamic. It opens up opportunities for agricultural employment; improves communications and allows for greater access to non-agricultural employment; as well as increases options for service delivery. The creation of farm-to-market road networks in the 1960s pulled together one national market in what had previously been autonomous regions. Farm-to-market roads promoted new markets, increased interaction among villages, linked agricultural production areas to crop collection and distribution centres, and made new crops economically viable. However, if due consideration is not given to the development of complementary urban-rural linkages, it is possible to stifle local development initiatives when rural areas are opened up to urban entrepreneurs (Ndegwa, 2005). This is due to the socio-economic shocks experienced in previously marginalised areas which ensue almost immediately after rapid exposure to new value systems and/or socio-cultural influences, before the systems and/or economic units are adequately oriented to cope and adjust to the new change.

3.5.2 Economic Linkages

Urban areas have always been an outlet for primary products and produce from rural areas. Economic ties are bound by perception as they are by knowledge and reason. The physical linkages allow for economic connections that operate as separate yet complimentary elements. Economic linkages, on the other hand, determine the survival of nodal centres, carrying the weight of responsibility for bilateral interrelation and

complementary development. Economic linkages pave way for specialisation as well as diversification of skills, knowledge and needs, allowing for opportunities that could be of varying conditions, such as non-farm employment opportunities. Linking resources to market centres is a primary basis of the commercialisation of agriculture, diversification of production and expansion of special spatial systems of exchange. Spatial articulation is facilitated by the development of intermediate towns and efficient road networks.

Commercial enterprise in Kenya depends on rural areas for the supply of consumer goods. This feeds into the processing and manufacturing sectors, carrying with it the bulk of national exports, which directly impact the GDP. Since the agriculture sector in Kenya accounts for approximately 35% of the national GDP, it is appropriate to highlight agricultural output and trade as the structural elements of Kenya's economy. This sector touches on various important entities throughout the country's economic footprint. As shown in figure 4, agriculture for the purpose of food production has numerous underlying factors impacting their implementation. From the research and development to create seed and farm inputs; provision of farm inputs through regional and bilateral agreements with international bodies and external partners; policies influencing agriculture and trade associated with it; systems for marketing, food markets and valuing of agricultural output; provision of infrastructure for trade and sale of food; access to credit and capital investments in food production; access to information on best-practice for agriculture and extension services. This multi-level, interdisciplinary approach to agriculture not only impacts production and sustainability but also food security and agricultural viability.

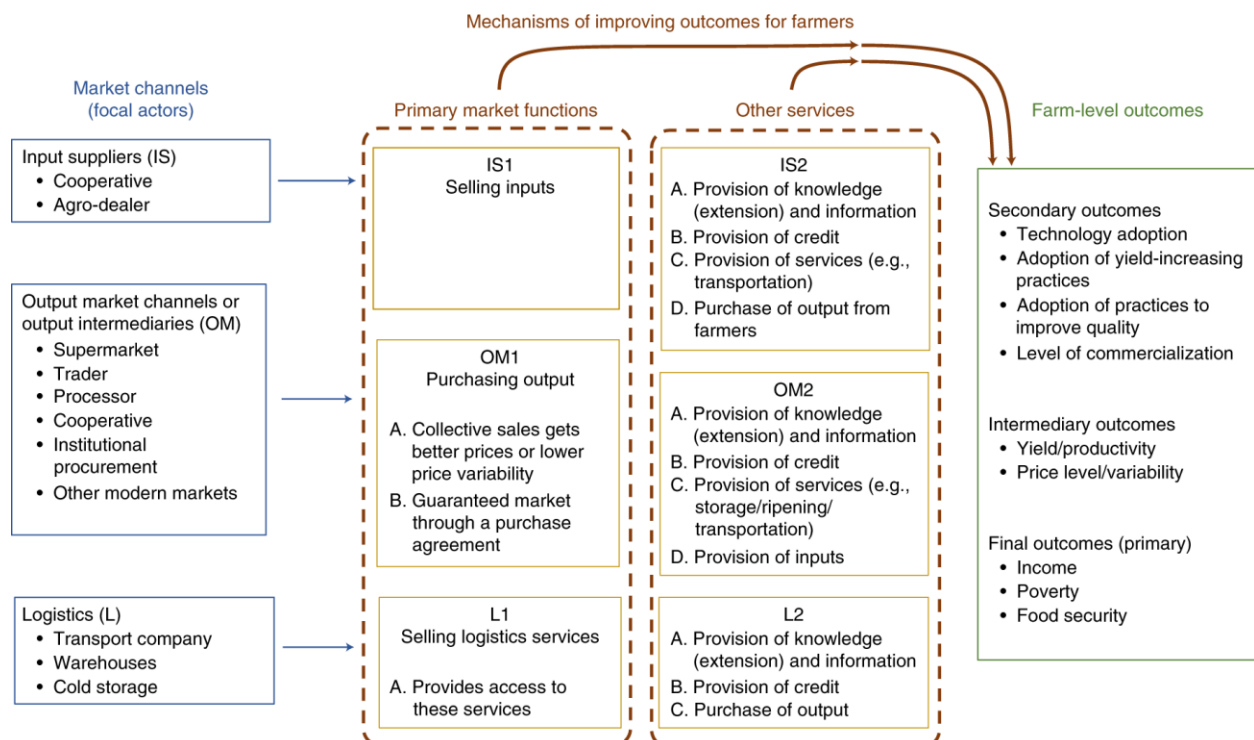


Figure 4: Mechanisms of improving outcomes for farmers. Adopted from: www.nature.com

Urban wholesalers rely on Periodic markets for rural produce for urban families. These markets are unique in that they each operate independently, while at the same time being dependent on the existence of the periodic market circuit for existence. Some markets have permanent stalls and shops which allows them to operate year-round. They are however compelled to relinquish power of autonomy to allow for broader development through participation in the periodic market system. This is an economic gamble and should be treated as such. For accuracy, it would serve well to calculate urban-rural income transfers to determine the flow of economic advantage from centre to centre; centre to hinterland; hinterland to centre and also across the hinterlands.

3.5.3 Population Movement Linkages

Human capital transfers form a substantial percentage of the issues of disproportionate development in rural areas. Sessional Paper No.10 of 1965 on *'African Socialism and Its Application to Planning in Kenya'* highlighted the glaring deficiencies of human capital in food production areas. It indicated the importance of migration into the rural hinterlands in an attempt to jumpstart the dwindling economic capacity of food baskets. This was in the wake of the rural-urban exodus, especially of the able-bodied youth in search of 'formal employment.' Over the decades since the sessional paper was published, it has been noted that the nature of migration of people from rural to urban areas has significantly held constant. The migration to urban areas has been halted by the provision of amenities in rural areas. In some cases, it is noted that the migration is reversible, provided that the available conditions make it favourable for said relocation. However, migration dynamics have added a unique blend to the matrix. The notable trends include **urban-to-rural**; **urban-to-urban** and **rural-to-rural**, each due to unique conditions catalysed by pervasive pull factors and favourable living conditions.

3.5.4 Social Linkages

These linkages are propagated by communities and neighbourhoods within locales that inspire assembly, public action and involvement in day-to-day activities by people. The resultant food markets and social interactions from trade and assembly create linkages among people within physical reach of each other, and as technological advancement would have it, within online proximity of one another. These social interactions create the need for the provision of social services at nodal points. This calls for the incorporation of assembly in the design of public spaces, be it as an entity of trade or plutonic association.

3.5.5 Political and Administrative Linkages

Political linkages secure development resources for central government agencies and the urban-based elite for community-based projects within rural areas. This results in the trickle-down effect of resources as they traverse the political backwater from points of administrative interest to areas of higher vulnerability

or of public interest. Devolution in Kenya has allowed for a broader, more intrusive interaction with these previously marginalised areas, where previously side-lined people are gaining a voice to express their malcontent with the prevailing conditions as well as allowing them a platform to set a pace for their intentions and desires. Progressive elements such as crowd-funding for community-based initiatives and neighbourhood projects have been seen to improve the conditions of underdeveloped rural areas.

3.6 Theoretical Framework

Theories do not provide answers to problems, people do. But theories can provide a framework for analysis (Forester, 1993). The academic inclination towards binding theoretical undertones to practical application introduces the aspect of precedent knowledge to social and natural sciences. This permeates the understanding and feasible growth of the body of knowledge by either acknowledging premise or by diverging into other concepts and models for better accommodation. The theories applied in this study include *The Chaos Theory*, the *Geddesian Triad Concept* and the *Economic Location Theory*. The foundations of these theories are interrogated to appraise the current situation in the study area and bring to light factors which may enable a better contextual understanding in relation to urban-rural linkages from the hinterlands to the market centres; the flow of resources, with food as a core variable and the state of the rural socio-economic systems as a product of the flow of human capital.

3.6.1 The Chaos Theory – The Butterfly Effect Concept

Presented in 1972 at the 139th meeting of the America Association for the Advancement of Science, meteorologist **Edward Lorenz** gave a talk entitled, ‘*Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?*’. Amassed from a host of previous studies on the predictability of phenomena based on initial conditions, this study resulted in what is now widely referred to as the **butterfly effect**. It offered the first example of a physically relevant dynamical system that presented all the characteristics of chaos. Individual characteristics were unstable but their asymptomatic behaviour seemed to be insensitive to initial conditions. In his presentation, he states, (Lorenz, 1972).

Lest I appear frivolous in even posing the title question, let alone suggesting it might have an affirmative answer, let me try to place it in proper perspective by offering two propositions.

- 1. If a single flap of a butterfly’s wings can be instrumental in generating a tornado, so also can all the previous and subsequent flaps of its wings, as can the flaps of the wings of millions of other butterflies, not to mention the activities of innumerable more powerful creatures, including our own species.*
- 2. If the flap of a butterfly’s wings can be instrumental in generating a tornado, it can equally well be instrumental in preventing a tornado. More generally, I am proposing that over the years minuscule disturbances neither increase nor decrease the frequency of occurrences of various weather events such as tornados; the most they may do is modify the sequences in which they occur.*

The purpose of this study was to illuminate the need for comprehensive interrogation of innate properties in a system whose direct impact might be conceived as minuscule, yet bearing the capacity for significant paradigm-altering consequences, as in the case of storms. He famously concludes by deducing that further study into the phenomenon, could be focused vertically for a comprehensive analysis in his words:

We must therefore leave our original question unanswered for a few more years, even while affirming our faith in the instability of the atmosphere. Meanwhile, today's errors in weather forecasting cannot be blamed entirely, nor even primarily upon the finer structure of weather patterns. They arise mainly from our failure to observe even the coarser structure with near completeness, our somewhat incomplete knowledge of the governing physical principles, and the inevitable approximations which must be introduced in formulating these principles as procedures which the human mind or the computer can carry out. These shortcomings cannot be entirely eliminated, but they can be greatly reduced by an expanded observation system and intensive research. It is for the ultimate purpose of making not exact forecasts but the best forecasts that the atmosphere is willing to have us make.

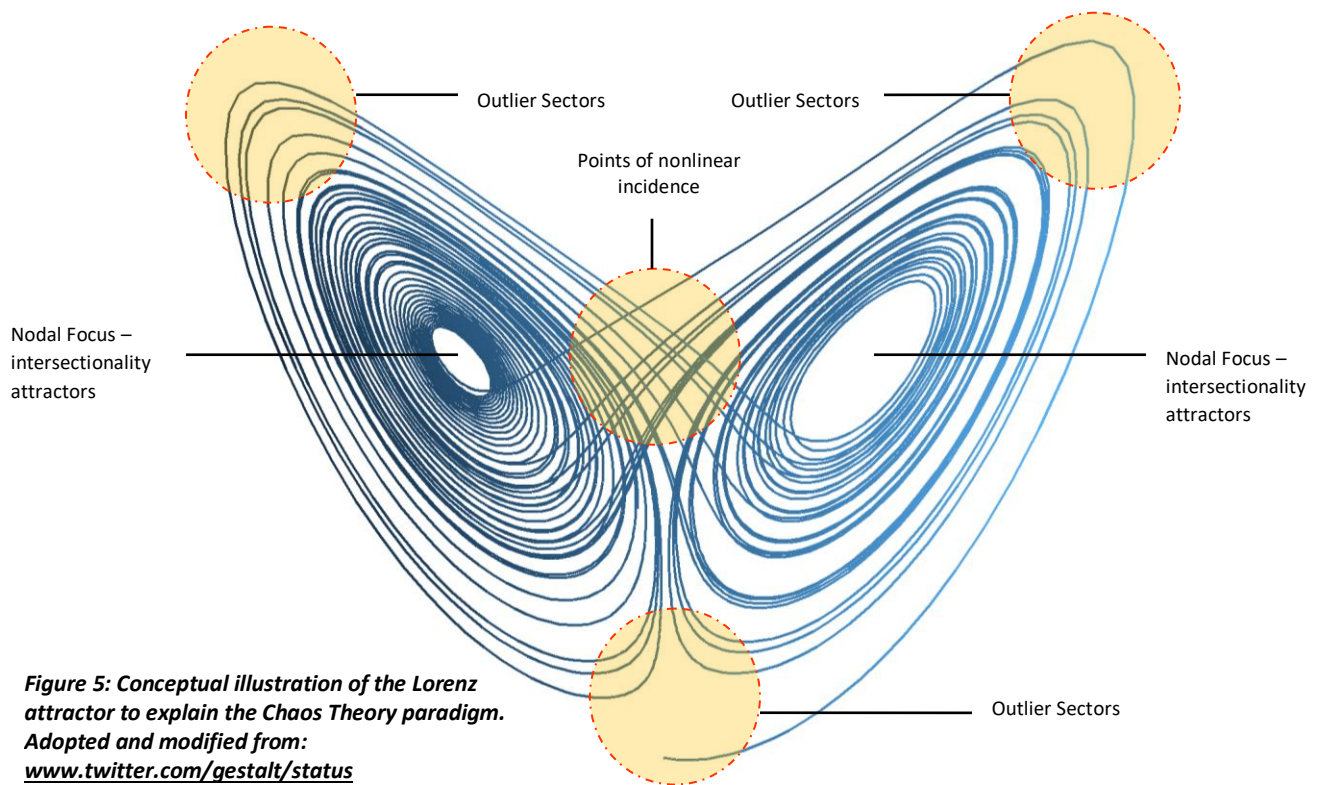
In 1960, Lorenz presented findings from a probability study on weather forecasting, describing how a system could be explicitly solved using elliptical functions whereby the solutions would be quasiperiodic¹¹ in time (Lorenz, 1960). Lorenz's observations go much further than the fact that **his** differential equation is sensitive to initial conditions. He noticed that these unstable trajectories seemed to accumulate on a complicated compact set, which was itself insensitive to initial conditions and he described this limit set in a remarkably precise way. There exists some compact set '**K**' in the ball such that for almost every initial condition '**x**', the trajectory of '**x**' accumulates precisely on '**K**'. This attracting set **K** (now referred to as the *Lorenz attractor*) approximately resembles a surface presenting a **double** line along which two leaves merge. The study is however considered to have left out an important aspect, that if one slightly perturbed the differential equation, for instance by modifying the values of the parameters, or by adding small terms, then the new differential equation would feature the same type of attractor with the general aspect of a branched surface. Supported by '*determinism*', one of the foundation pillars of science, this theory has been speculated and studied for its capacity to generate predictive possibilities through the rationality of probability. Given a mechanical system, be it the solar system or a collection of molecules in a room, one can derive a differential equation governing the motion. If the current position and velocity of the system are known, then it is possible to derive a differential equation which determines probable location, hence defining the future of the elements in motion (Ghys, 2015).

While this is inherently difficult to predict the future, even in this way, it is apparent, that there are ways in which the present, through the principle of determinism would influence the future. In his Essay, '*Essai philosophique sur les probabilités*' (Laplace, 1995), Laplace best explains this into what is now referred to as **Laplace's demon**,

'We ought then to consider the present state of the universe as the effect of its previous state and as that which is to follow. An intelligence that, at a given instance, could comprehend all the forces by which nature is animated and the respective situation of the beings that make it up, for moreover it was vast enough to submit this data to analysis, would encompass in the same formula the movements of the greatest bodies of the universe and those of the lightest atoms. For such an intelligence, nothing would be uncertain, and the future, like the past, would be open to its eyes.'

¹¹ **Quasiperiodic** – is an element of a system which displays irregular periodicity. While periodic behaviour can be defined as recurring at regular intervals, quasiperiodic behaviour is a pattern of recurrence comprising a component of unpredictability which does not lend itself to precise measurement.

However, as unpredictable as the resultant factors were, the attractors seem to retain the graphical image as represented in figure 5 below for graphical elucidation on nonlinear orientation. Guided by precedents in Newtonian physics, this theory has been seen to penetrate both scientific and non-scientific spheres from unique angles. **Chaos theory** mathematically elucidates how a small change can lead to dramatic structural alteration. ‘Mathematically’ implies that the theory demonstrates rigorously not only a beautiful phenomenon but also, more importantly perhaps, the mechanisms controlling the system, and the status under which the phenomenon is observed (Zhang, 2021). The introduction of this paradigm into the social sciences may be attributed to the recognition of nonlinearity, apparent uncertainty and unpredictability within the natural sciences, political and socio-economic environments.



In an attempt to comprehend and evaluate these uncertainties, unpredictability and nonlinearity aspects of social behaviour systems, the adoption of this theory carries. Defined as a study of the temporal evolution of nonlinear systems (Kiel & Elliot, 1997), nonlinear dynamics reveal undercurrents involved in the relationships between unstable variables.

Introduced into urban and regional planning, the basic component of the socio-economic structure of all rural-based systems is its nonlinearity. Be it a change in policy, administration, attractive features of a growing neighbouring urban area, education reforms or even climate change. External factors are seen to hold the capacity to alter important efforts previously attempted with the aim of solidifying growth and development strategies, sustainability and even basic survival. The issues of food security, recycling of

currency, economic stability and/ or growth and smooth transition of land use in response to urbanisation are related to the relationships between the urban, peri-urban and rural. This study applies models derived from the *Chaos Theory* to arrive at possible strategic solutions to alleviate marginalisation. This is created by disproportionate development strategies, poor or non-existence thereof planning of rural areas and sustainability. It is in a bid to generate a template to assess the nature of periodic markets as a cluster of interrelated systems and their inherent influence on land use, socio-cultural needs matrices, stratification and socio-economic empowerment.

3.6.2 Geddesian Triad

Coined by Sir Patrick Geddes, the principles that comprise the triad - **place**, **work** and **folk** - elucidate a point of view that binds the intimate and causal connections between an individual’s social development to the cultural and physical environments. The basis of all urban planning, as illustrated in figure 6, is the creation of organic symbiotic relationships between people, their socio-economic activities and cultural identity bound by a spatial framework.

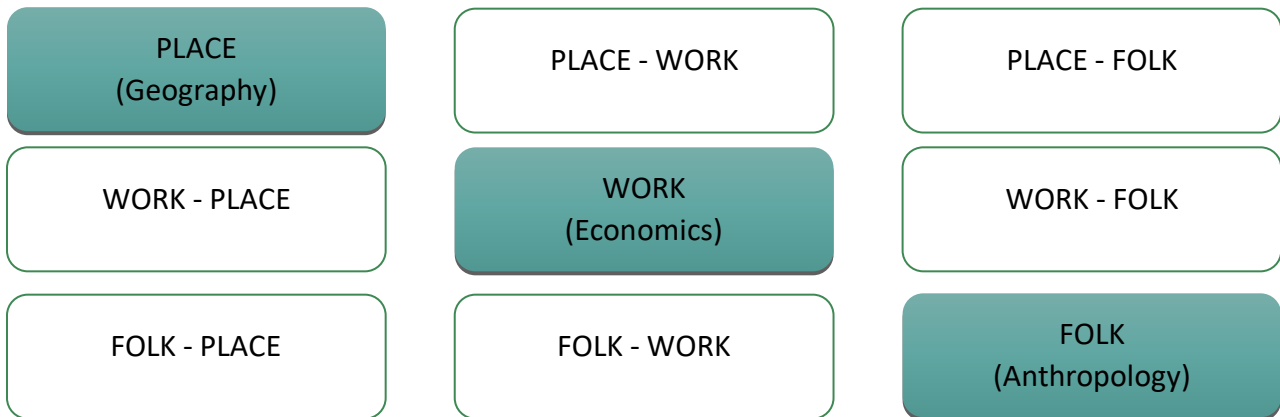


Figure 6: Theoretical Framework – Geddesian Triad

As a biologist, Patrick Geddes was the first one to advance the idea that both the city and the environment should evolve closely together. He argued that the city was not a closed autonomous organism but rather was located inside an environment taking and dissipating energy. A still early and incipient form of the later called concept of ‘Ecology’ focused on the conservation of nature. The bad and the good city defined by Geddes as *Cacotopia* and *Eutopia* are elaborated using thermodynamic concepts. While *Cacotopia* dissipates energy to obtain individual monetary benefits, *Eutopia* conserves the energy to organize the environment and thus allows an adequate evolution of collective and individual life¹² (**Geddes, 1915**).

This stands to show, that the elements of urban design are grounded on appreciating communities and societies as systems that flow into each other and combine, to establish coherence. However, the systems

¹² Cities in Evolution – Patrick Geddes | Evolutionary Urbanism - <https://evolutionaryurbanism.com/>

need not always align to convey success. Rather, they can be motivated by various external forces. This framework aids in understanding the motivation for which people gravitate towards certain ideas and behave in a certain way, hence its adoption. In the case of periodic farmers markets, the idea of organic growth, as illustrated in figure 7, is consolidated with the notion that development is dependent on pre-existing conditions and gradual progression as in the case of organisms in nature. This results in cumulative growth, variant dependency ratios and development over a duration of time. The transport corridor, which serves as the main artery of socio-economic enterprise in the study area, is considered a socially-induced entity that evolved into a geographical unit of place-identity which compliments the spatial autonomy of the region it dissects and eventually defines.

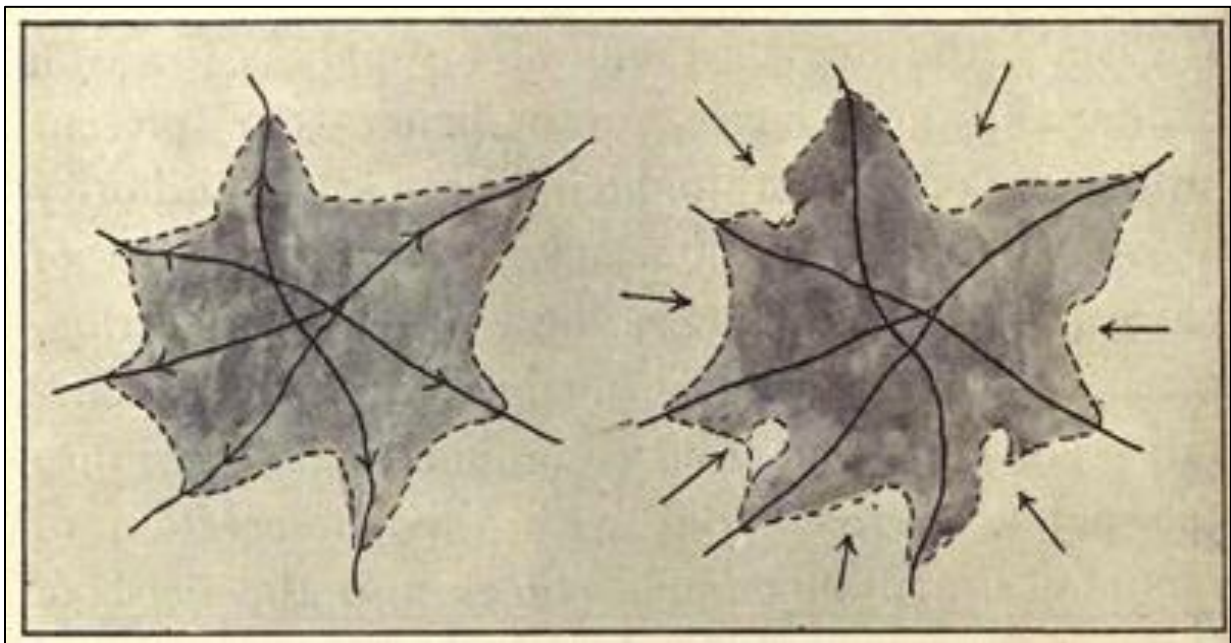


Figure 7: the Geddesian concept on organic growth of towns. Adopted and modified from: <https://evolutionaryurbanism.com/>

3.6.3 Economic Location Theory - Concept of Periodic Markets in Africa

Promoted by need, insufficiency, and/or abundance, trade is one of the most critical cultural behaviours which endorsed contact and exchange of ideas, merchandise, and services between individuals and communities which diversely transformed African societies in various regions and over time. The Periodic Markets concept in Africa are a pre-colonial phenomenon. It supported inter-cultural relations through the exchange of all manner of commodities following a rational barter-trade system for goods and services produced by some communities in exchange for commodities produced by, or in the possession of other communities. This allowed for the exchange of surplus produce, for supplies that were not locally sourced. Given the eminent regional variances across the African continent, it is essential to combine multiple techniques and sources, in a multipronged way, to deliver a dynamic image of the mechanisms of

pre-colonial African trade and exchange of various time periods. These trade systems are perceived to have been incredibly efficient at a time when an economic value was attached to commodities based on necessity rather than on monetary currency. It has been historically difficult to map out the trade and exchange of organic perishable commodities as in the case of grain and livestock, due to the lack of well-resolved documentation. However, commodities such as glass beads, metal artifacts, porcelain, and ceramics, which are pyro-technological products with a higher survival rate have allowed for archaeological visibility of trade throughout the African continent (Chirikure, 2017). Through successful traditional socialist systems in place at the time, trade held significant value as it protected the needs of the various communities by participating in the rationalisation of the commons.

This form of geo-localised trade materialises in modern times as a manifestation of institutionalised periodic markets. What was originally planned through seasonal algorithms and mixed-method communication systems currently operates on a large-scale organised highly publicised system in the guise of economic location theory. Choice and place form the fundamental basis for the creation of periodic markets. This defines the hegemonic dependence on specific central nodes spatially selected for convergence and distribution for perceived sustainable regional economics. The balance is formed through interrelations that propel subjective development within selected growth areas. This is for the purpose of redistribution within a larger catchment area through a bespoke intangible network of service delivery and communication. Often, the timing of various activities carries a strong periodic element. Due to circumstances, an activity is sometimes made outside the regular cycle without breaking the cycle, thus rendering the timing of future activities highly predictable (Huberman, 1988).

3.7 Case Studies of Farmers Markets: La Boqueria Market, Barcelona, Catalonia

Mercat de Sant Josep, locally referred to as La Boqueria market, is located in the heart of Barcelona. This picturesque market comprises a metallic/ glass exterior as seen in figure 8 and a flexible picturesque interior. As one of Europe's most famous food markets, it is a place that warrants visitation. The exquisite display of food commodities makes it a tourist attraction in addition to being a food market. It comprises foods from various nationalities and in numerous forms. The idea of food is conceptualised through the trade of all commodities so described. Meaning that the trade of food in various stages of the value chain exists.

This ranges from fresh farm produce to processed food, cooked/ parboiled food, frozen foods, drinks, and beverages, to state but a few. The variety accommodated is seemingly endless.

The market, as seen in figure 9, is designed with both the vendors and consumers in mind. It features pedestrian-friendly alleys that allow for: browsing; purchasing; comparing; tasting and even meeting. The displays are made using human ergonomics suitable for viewing, weighing, and even touching of commodities before, during, and after procurement. This is made possible by ensuring that adequate space is allotted for traders, consumers, and pedestrians. The differentiation of stands is further aided by zoning within the market which is guided by types of food and their specific stages in the value chain as well as the nature of consumption. Raw foods are kept away from consumer-ready foods for ease of navigation.

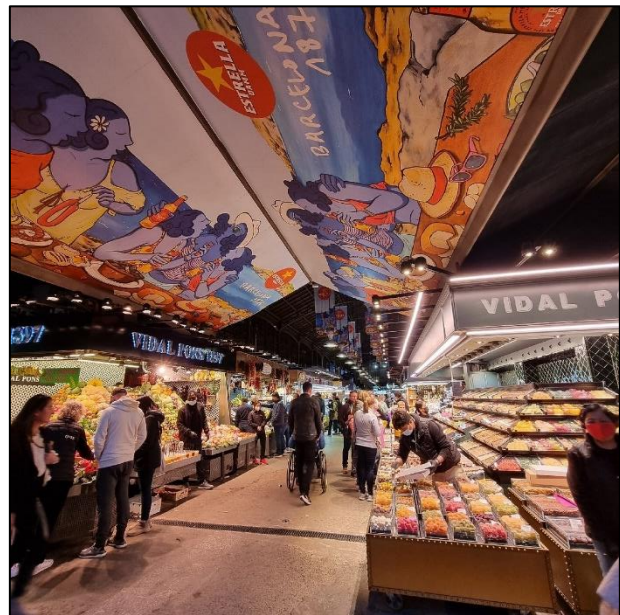


Figure 9: Entrance lobby at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

3.7.1 The Fresh and Processed Fruit Section



Figure 10: Fresh and processed fruit stands at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

Fruits from all over the world, under one roof, sounds like a compelling selling point for those who are so inclined. More so when they are easy to find. With the onset of online shopping and the convenience of supermarkets, the alternative option of being in the presence of fresh produce with a story behind them makes for a far better grocery run. The combination of stalls as seen in figure 10, with different products on a singular theme of ready-to-consume fruits makes planning easy and shopping way more active as the options availed and strategically located make the entire process way more convenient.

3.7.2 Animal Produce Section



Figure 11: Fresh and processed meat stand at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

Fresh and preserved animal produce requires special spatial consideration in a food market. This is due to the perishable nature of commodities, special facilities for storage and display, human contact, and more importantly, lack thereof. Public health involvement is required to ensure the healthy status of food before human consumption. Figure 11 shows various animal produce stands in the market. The various displays accommodate different typologies, and different products and this gives a visual appreciation of available produce. For processed meats as seen above, different packaging options allow consumers to make informed choices of what they desire. The display ergonomics make it handling easier and safer.



Figure 12: Fresh eggs stand at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

Some produce, as in the case of eggs, as seen in figure 12 holds true to its identity in the farm practices involved. The visualisation of a farm in marketing makes the products feel more authentic and it does not take away the experience from either the farmers or the buyer. The fish market on the other hand is characterised by the smell. Planning for an area that supports fish trade requires olfactory consideration alongside site planning. This justifies special zoning as some commodities could potentially make an entire market uninhabitable if left unchecked. Figure 13 shows one such display, where consumers have space to choose their cuts and inspect their preferences without the physical handling of raw meat.

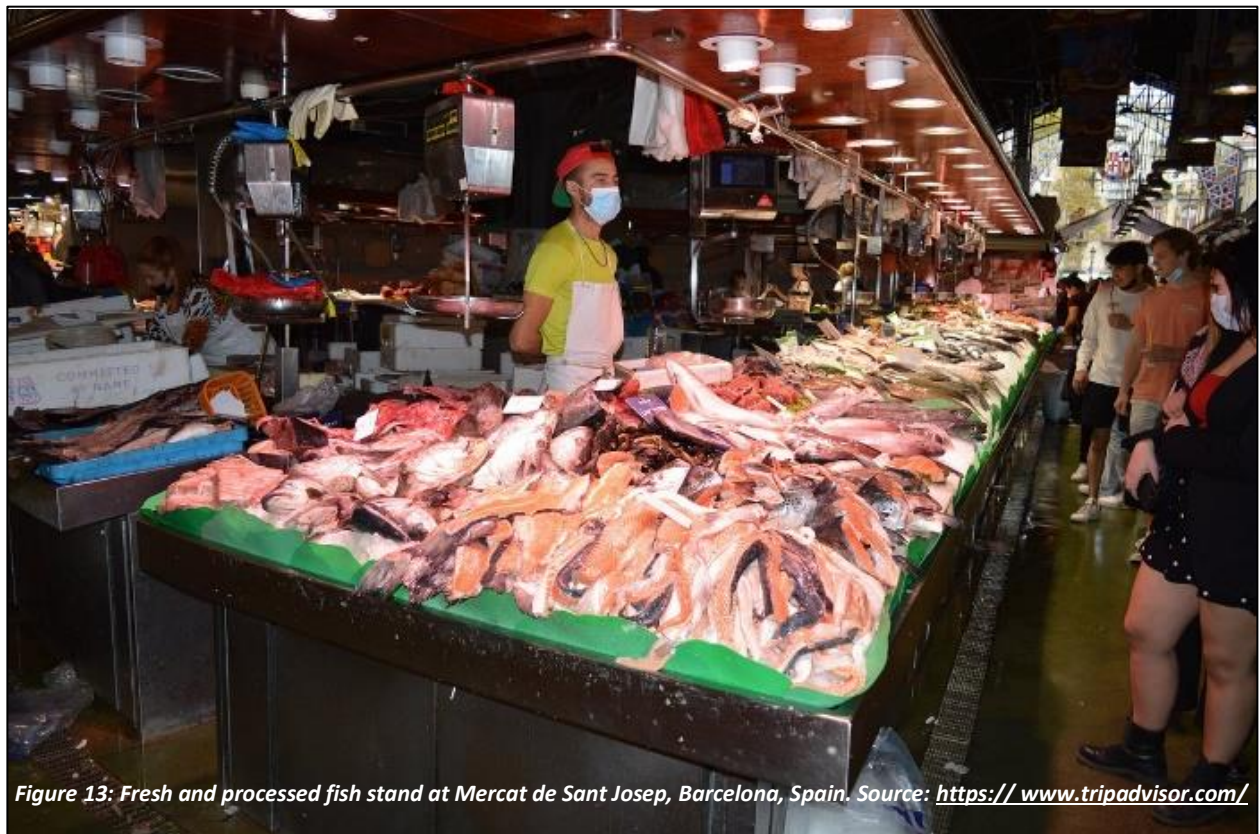


Figure 13: Fresh and processed fish stand at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

3.7.3 Food Eateries and Bars



Figure 14: A bar with a serving station at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

Small eateries and bars as seen in figure 14 above are part of the food market. As they operate, they allow customers to take a break from the movement around the market. This allows them to taste local produce at its finest and also acts as focal points of interaction. Market-goes differ in the same way as the products they seek. As such, the provision of ready alternatives is welcome for all the participants within the market. Socialization is a major part of the market experience. So, it stands to reason that spaces that accommodate people in form of service delivery as in the case of small bars and cafes be part of the market, not extruding but as strategic components. This is while considering that stalls that deal in ready food also differ. There are hot kitchens and cold kitchens as well as ready-food stands without kitchens as in the case of baked goods. All these are also part of the market exhibit and experience. The various options availed generate an interactive system. The connections and varieties, as well as distinct bespoke designs, make marketplaces all the more fulfilling.

3.7.4 Lessons Learned from Mercat de Sant Josep



Figure 15: Pedestrian and consumer-friendly market stands and alleys with directional signage at Mercat de Sant Josep, Barcelona, Spain. Source: <https://www.tripadvisor.com/>

Trade is universal. The idea behind what is sold can only best be described through the experience of the intended audience. Food requires careful planning and integrated design. While the stands may be different, zoning is important so as to avoid conflict in the characteristics of the food being sold. Markets need sections of interaction as well as sections of active movement as illustrated in figure 15 above. The negative and positive spaces allow for efficient operationalisation of the market. This is while considering the veritable importance of the food trade as a cumulative immersive experience, rather than a product of mere utility and redundancy. The aesthetic value of food can be enhanced by the involving general aesthetics of the marketplace as a node for socio-cultural and economic interaction. We are what we eat, we might as well enjoy the experience too.

3.8 Case Studies of Livestock Markets



Figure 16: Design for new livestock market for Holsworthy by Grainge Architects. Source: <https://www.graingearchitects.co.uk/>

Suited on a 34-acre land parcel of land, the greenfield development is situated on the outskirts of Holsworthy, Torridge District, North Devon County, in South West England. Its planning and eventual construction was a collaborative effort between the local community, the Torridge District Council, various stakeholders, and livestock market operators. As indicated in figure 16, the complex comprises a livestock building, with associated show rings, vehicle and service areas, and a cloistered courtyard containing: chattel buildings, offices, and a café. The portal-frame structural system used is a successful element of building technology that opens up the interior of the market for practicable flexibility of utility based on market capacity. The structural support accorded allows for openness and reduces the need for structural walling. The design accommodates exterior spaces for hoarding livestock prior to the sale, for inspection as well as support facilities that enable monitoring and evaluation of livestock before introduction into the market.



Figure 17: Larger cubicles for bovines. Source: <https://www.grainqearchitects.co.uk/>

The bovine section shown in figure 17 above allows for safe viewing of the cattle before the auction. This guarantees a secure environment for the animals during the transition period and protects prospective buyers and traders from possible incidents. The controlled movement allows for better browsing, wider visibility, and visual range, as well as convenience in the exchange process. The barriers aid in the movement of select animals from one point to another without disrupting the entire herd. The design also enables the isolation of sick and sickly animals.



Figure 18: Smaller cubicles for goats and sheep Source: <https://www.grainearchitects.co.uk/>

The cubicles for smaller mammals, as seen in figure 18 above, are designed to accommodate a specific number of animals based on standards on animal welfare requirements. This is done to ensure security for animals, handlers, and customers. It makes for ease of identification of animals by traders and buyers, for detection of sick individuals, and also keeps livestock in controlled stasis for ease of management and sale. For goats and sheep, the display of animals without the handler makes the trading processes more appropriate. The alleyways provided are adequate for movement and viewing, aiding in crowd control which is endemic in livestock markets. The organisation of animal entry, display, isolation, and exit makes for a more efficient livestock market environment.



Figure 19: Livestock market for Holsworthy, Torridge District, North Devon County. Source: <https://www.grainqearchitects.co.uk/>

A controlled trading system and revenue collection for the county ensures better management of the livestock market. The strategic location of parking, loading, and support facilities makes the market more user-friendly and accessible. The structural integrity of the market fabric allows for better regulation of the interior environment, shelters the market from environmental forces, protect the animals from injury, and ensures that the consumers obtain value for their money. The community project, as seen in figure 19 above, is highly interactive necessitating intensive public participation in its establishment.

3.9 Lessons Learnt from Case Studies

Markets are not just centres for trade. Rather, they can be considered nodes for socio-cultural expression. The ability to dispose of agro-industrial commodities created through will and determination, combined with knowledge and nutrition, goes a long way in expressing place identity. What constitutes 'local food' is only as valuable as the capacity to consume it. As such, markets are meant to be spaces where freedom for trade is visualised, monetised, and publicised. These unique spaces, which avail the opportunity for activities of such socio-cultural importance, are meant to be envisioned with that purpose in mind. The design of markets as well as their integration into the urban landscape enhance the value of a locational context. So, while the main activity for some may be trade, for others, it may be nourishment, for others still, association. But for all involved, the basis remains to be the connections created.

The design of markets plays a significant role in how they are perceived, received, and utilised. Therefore, it would stand to reason that the implementation of design strategies should rationalise these ordeals for the achievement of sustainable urban integration, especially where farmers markets are concerned. Rural or urban, food is universal, and so should it be treated. How it is packaged to the public, through Planning and Architectural design defines whether the markets are to be considered a significant urban component or a neglected consequence of rural gentrification.

3.10 Conclusion

As long as issues of social and spatial polarization (so often linked to economic reform, restructuring, and the internationalization of trade and production) are not addressed, it is unlikely the regional economic growth policies can contribute to significantly equitable development and more successful poverty reduction (White, 2005). This is while we contemplate the impact of small and intermediate urban centres and markets on the local economies. Farmers markets tend to create a point of revenue collection for local authorities. This includes licenses, levies, and permits by which local authorities are able to control the market, regulate spatial delineation, propose sustainable management, provide for health and sanitation, mitigate and control possible outbreaks, and manage wastewater, among a host of other physical planning needs. However, in the event of poor planning, regardless of the economic contribution, the needs might result in unbalanced planning. This calls for comprehensive integrated planning as a formative need for both the built and the natural environments. The socio-economic factors may be used as a blueprint in the determination of the need matrices.

CHAPTER FOUR

STUDY AREA

4.1 Research Situs

The study initially considered the market centres along the Machakos-Kitui highway within Machakos County, Kenya as seen in figure 20 below. Namely: Kaseve, Kĩthangathĩnĩ, Masii, Makutano, Wamũnyũ and Katangi. Among them **Masii**, **Wamũnyũ** and **Katangi** are periodic markets, in which exists an active cyclic system of operation. This also included interrogating connections made within the hierarchy of urban areas and markets, as need matrices trickle down the resources to the hinterlands, and/ or obtain resources from the rural hinterlands. The markets are categorically different, with each carrying a unique characteristic that definitively brings it out as a viable contender for socio-economic consideration. As individual market centres, they are considered as part of a cyclic economic system.

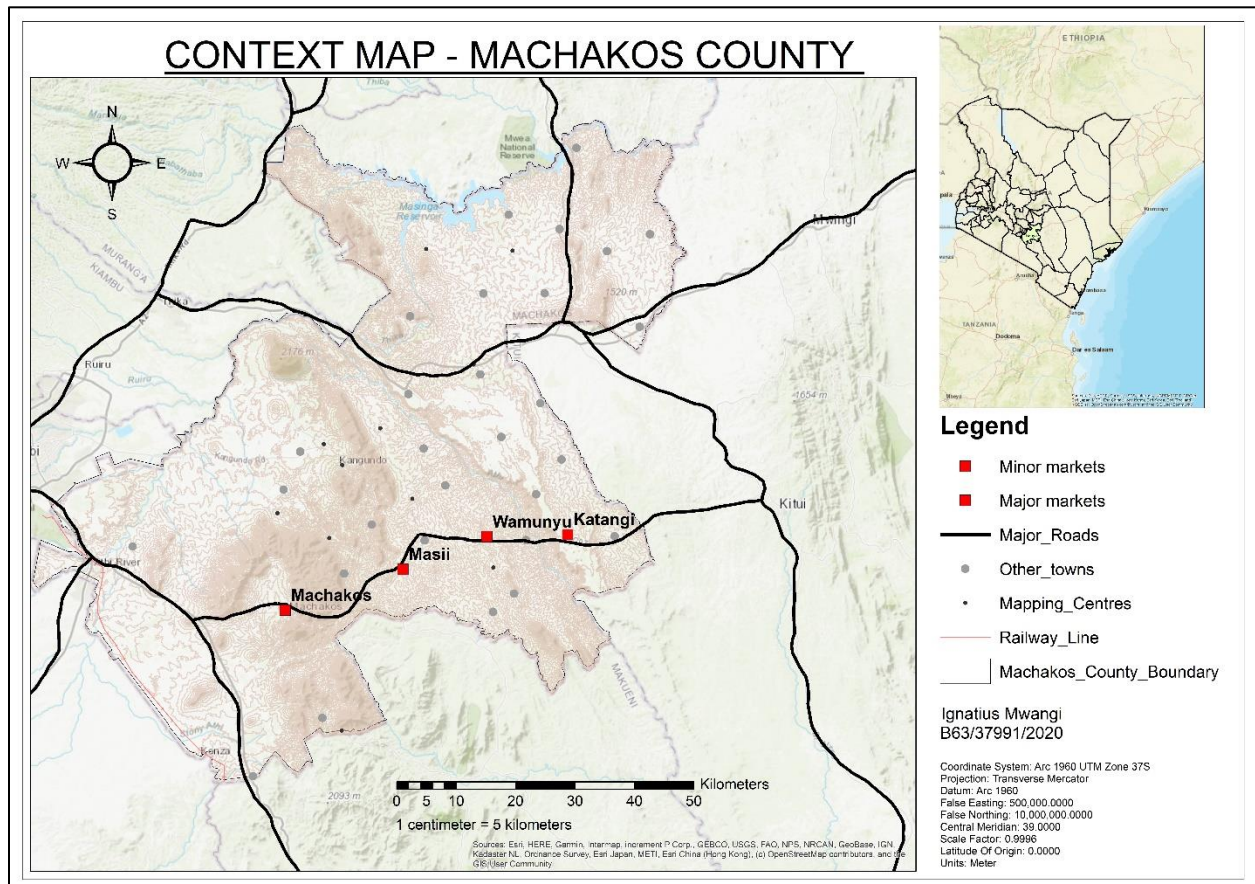


Figure 20: Context map - Machakos County

4.1.1 Kaseve Market Centre

Is the first market encountered along Kitui road, east of Machakos town towards Kitui County. It is perceived to be a relatively small market centre perched atop a very steep terrain. The market, though considered active throughout the day, every day, mostly for the benefit of drive through consumers, with a designated market-day on Fridays, it experiences its peak at very odd hours. It is considered one of the larger wholesale markets in Machakos county operating from as early as 3:00am to around 6:00am, upon which the nature of trade transitions to retail. This attracts bulk transit traders from all over the region to bring wares and also consume fresh produce from all over the country. Its uniqueness also happens to be its undoing, as the transition of activity still does not consider the spatial constraints created by the lack of a definite market boundary.

4.1.2 Kīthangathīnī shopping Centre

Is the second market centre along the Machakos-Kitui road, east of Machakos town. Its uniqueness is based on the fact that it exists due an intersection initial created by the T-junction branching into Vyulya markets centre – an old highly vibrant populous rural town in the bowels of Mwala sub-county. Only recently completed (in 2022) a bitumen road was added at the intersection connecting to Makueni county hinterlands and to *Tawa* market centre. The market centre may not necessarily operate as an actual market, but it is impacted by the growth of the connected nodes as a transitory hub, a junction centre and infamously as a peculiar accident-prone black-spot cloaked in a generously unpleasant history of pedestrian mortality. Planning cannot be overstated, as the dangers posed by any form of development could not only impede connection to the hinterlands of *Masii* but result in catastrophic circumstances if history is any indication.

4.1.3 Masii township

Is the largest, fastest growing urban centre in Mwala sub-county. The post-colonial township benefits from being strategically located between Machakos, Wote and Kitui towns and deliberately positioned at the junction of one of the busiest intersections leading to *Tawa* market centre, *Muthetheni* market centre, *Ikalaasa* market centre, *Wote* town and the larger Makueni county. Due to its influence in the territorial development of the larger south-eastern region, Masii township has preferentially benefitted from intensive investment from both the public and private sectors. It is considered the prime market in the *Masii*, *Wamūnyū*, *Katangi* periodic market circuit, and as such, is uniquely given two market days, unlike other market in the region that only get one. These market-days are on Mondays and Thursdays. It can independently serve the entire region given the chance, owed to its socio-economic endowment, but as part of the periodic market circuit, its mandatory latency allows for distribution of resources and human capital. This has seen to the gradual, albeit somewhat disproportional, growth in Mwala sub-county and

its environs. Masii township harbours numerous interconnected markets, among them, the largest bovine market in Machakos county. Masii township also happens to host the administrative offices for most government offices, such the County Commissioner, the Department of Criminal Investigation, the Sub-County Police station, Mwala Veterinary offices, the Forestry department and also the Sub-County Agriculture and Extension offices.

4.1.4 Makutano Shopping Centre

Is a junction-based market centre. This centre is however considered unique in that it is one of the few market-centre that was strategically stripped of capacity to holding a market-day, in favour of protecting Mwala town's economic autonomy, whose main access dissects the market centre at the intersection along Machakos-Kitui road, hence the name, Makutano - which means intersection/ meeting area/ congregation, etc. Makutano however serves a purpose unique to itself. It is the sub-county administrative headquarters for numerous public services offered to Mwala sub-county. These include: The Department of Registration of Persons, the Sub-County education offices, the TSC offices as well as the State Department of Public Service, Gender, Senior Citizens and Special Programs. The dynamics around its intentional negotiation with regard to socio-economic capacity is rather curious and worth interrogation.

4.1.5 Wamūnyū Market Centre

Is the fifth market centre along the Machakos-Kitui road, east of Machakos town. As a market centre, it has primarily grown due to art, rather than food, which makes it one of a kind. It is one of Kenya's leading producers of wooden handicrafts, carvings, timber-based furniture and also specialised labour in wooden craftsmanship. It is also a collection centre for livestock that are injected into the periodic market circuit for redistribution. It is connected to a heavily agricultural rural hinterland base with substantial stock in animal husbandry, and also happens to have the largest poultry and donkey markets in Machakos county. As a market centre far removed from urban proximity, intrusion into the road reserve is so severe, that upon construction of the now expanded Machakos-Kitui road, the centre is bound to lose over 27% of its entire retail-based space. Due to its linear configuration, it has allowed for sprouting of smaller adjacent centres, most notably *Miondoni* market centre, which remains economically vibrant almost solely due to trade in charcoal. Wamūnyū services smaller market centres within hinterlands such as *Yathui* market centre, *Nunga* market centre, *Kilembwa* market centre and *Athala* market centres. Understanding dynamics which allow for the flow of goods and services is important to mediate ways of planning for the growing, yet precariously located market.

4.1.6 Katangi Market Centre

Operates under the same pretexts as Wamũnyũ market centre, with a slight difference in its users. As the seventh market along the transport corridor, it offers a trans-county approach to trade. It is the main point of entry of livestock from the neighbouring Kitui county and is seen as the last Market centre in Machakos County along the Machakos-Kitui road. It is supported by the intensive agriculture, mostly irrigation-based, practised on the Yatta plateau and along the Athi River, which passes within proximity of the market centre. Unlike the other related markets, Katangi market centre deals with surplus from the rural hinterlands rather than consuming food resources from external sources. This makes Katangi an outlier in a way but as part of the periodic market circuit, offers opportunities for agricultural and socio-economic growth.

CHAPTER FIVE

DATA ANALYSIS

5.0 Introduction

The idea behind nourishment has historically been the prime basis of many a civilisation and its geopolitical scope. The ability to sustain a population, before all else, is gauged on the capacity to feed it. As such, the growth and development of cities, urban areas, and even rural areas can directly be tied to food security. When nourishment is threatened, hunger follows and insurgence arises. To quote Chef José Andrés, “*Food is national security, food is the economy, food is employment, energy, history. Food is everything.*” While analysing findings from the study, a narrative emerged. Agricultural proceeds define the economic backbone of the entire south-eastern Kenya region. Food trade goes a long way to establish some semblance of food security in the semi-arid region, in which Machakos county resides. The relationships created through the convergence of food at the market from all over the country and the distribution of that food throughout the regional rural hinterlands as a by-product of trade creates a web that runs deeper than the transport corridors established for its facilitation. It informs agricultural practice or lack thereof in the region, establishes trends in nutrition, circulates currency, allows for diversification and specialisation of labour, creates a need for various means of transportation, as well as influencing socio-economic identity and capacity.

The study identified direct relationships in markets intertwined with connections from three periodic farmers markets, namely **Masii** and **Wamūnyū**, located in Mwala sub-county and **Katangi** located in Yatta sub-county. These relationships spanned three sub-counties in Machakos County namely: Kathiani Yatta and Mwala sub-counties. Data collection and analysis were done using the study objectives for the purpose of answering the research questions.

5.1 Findings of Objective 1: Impacts of the Periodic Markets on the Development of their Contextual Setting

This was interrogated to assess the influences of periodic farmers markets on the physical environment within their geographical context. It involved scrutinising existing spatial, economic and political data, administration of instruments, observation and through the use of focus group discussions. This analysis touches on three market centres and their specialised markets namely: Masii, Wamūnyū and Katangi food and livestock markets. It attempted a spatial-temporal analyse model featuring different timelines and the impacts over that time. The study assessed the impacts of these markets on their surroundings, as well as the influence of the general surrounding on the markets themselves.

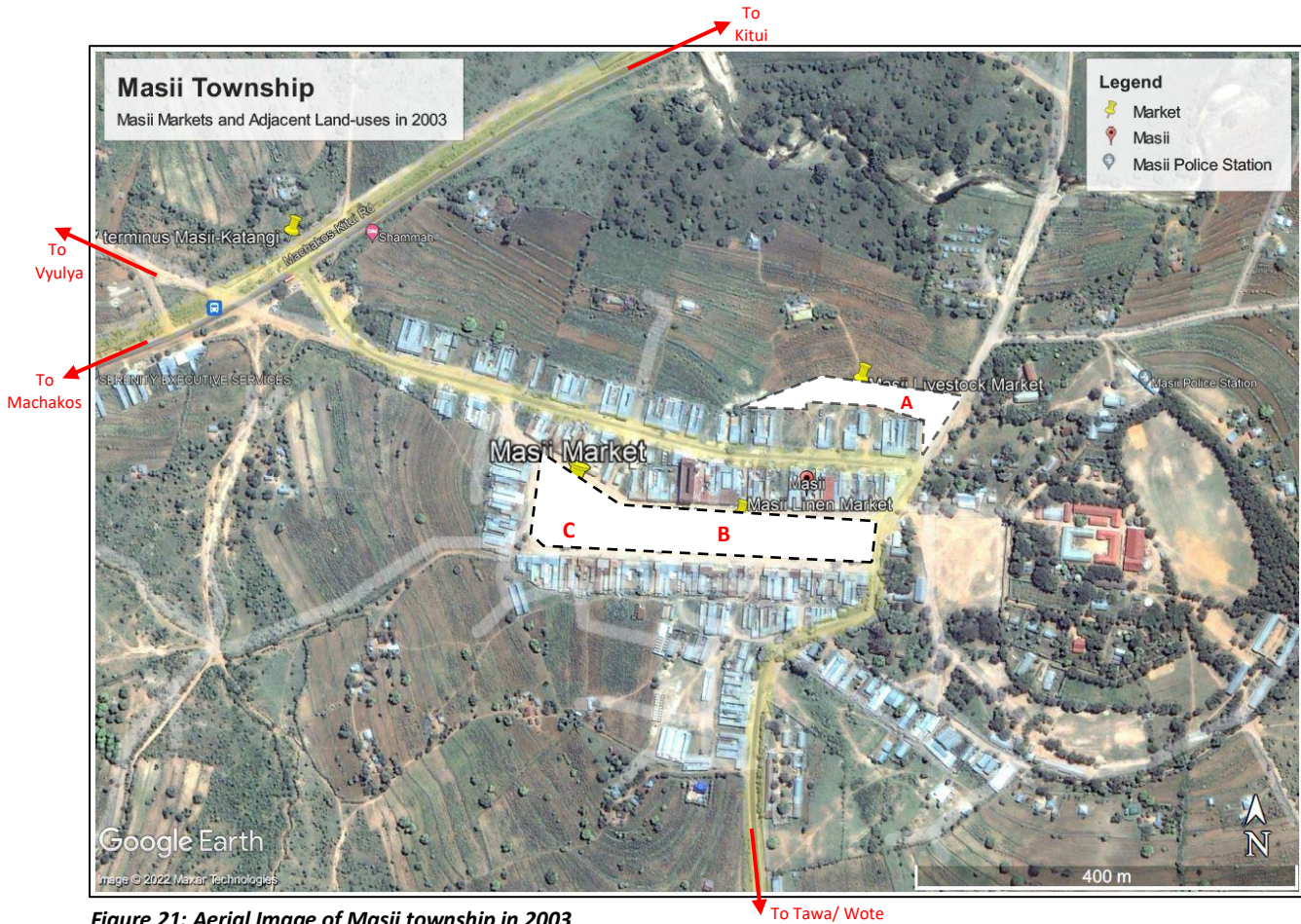


Figure 21: Aerial Image of Masii township in 2003

5.1.1 Trend Analysis of Masii Township

The Masii markets have evolved over time with the regional dynamics in play. The markets, over the last two decades, have significantly witnessed growth, differentiation by specialisation based on activities and volume and the concept of periodicity. This created need for differentiation of function and purpose due to the significant variance in commodities sold and the increase in market users. This is while considering the absence of physical expansion for the markets. In 2003, as shown in figure 21, the areas within the markets highlighted as **A, B, and C** were as follows:

A – Masii Livestock Market – was open and without a definitive boundary. Trade of livestock was ongoing but the herds were in a few hundred. The catchment was the local context. The markets grew especially due to Masii being a focal intersection of Machakos county, Makeni county and Kitui county

B – Masii Food and Linen Market – was characterised by the enclosed nature of the spaces provided by the Municipality at the time, framing the market using inward-facing stalls. These stalls allowed for trade year-round regardless of the periodic market.

C – Masii open-air market – this was used by food and linen traders during periodic market days. It was open and allowed the traders to place canvases on the ground and display their wares.

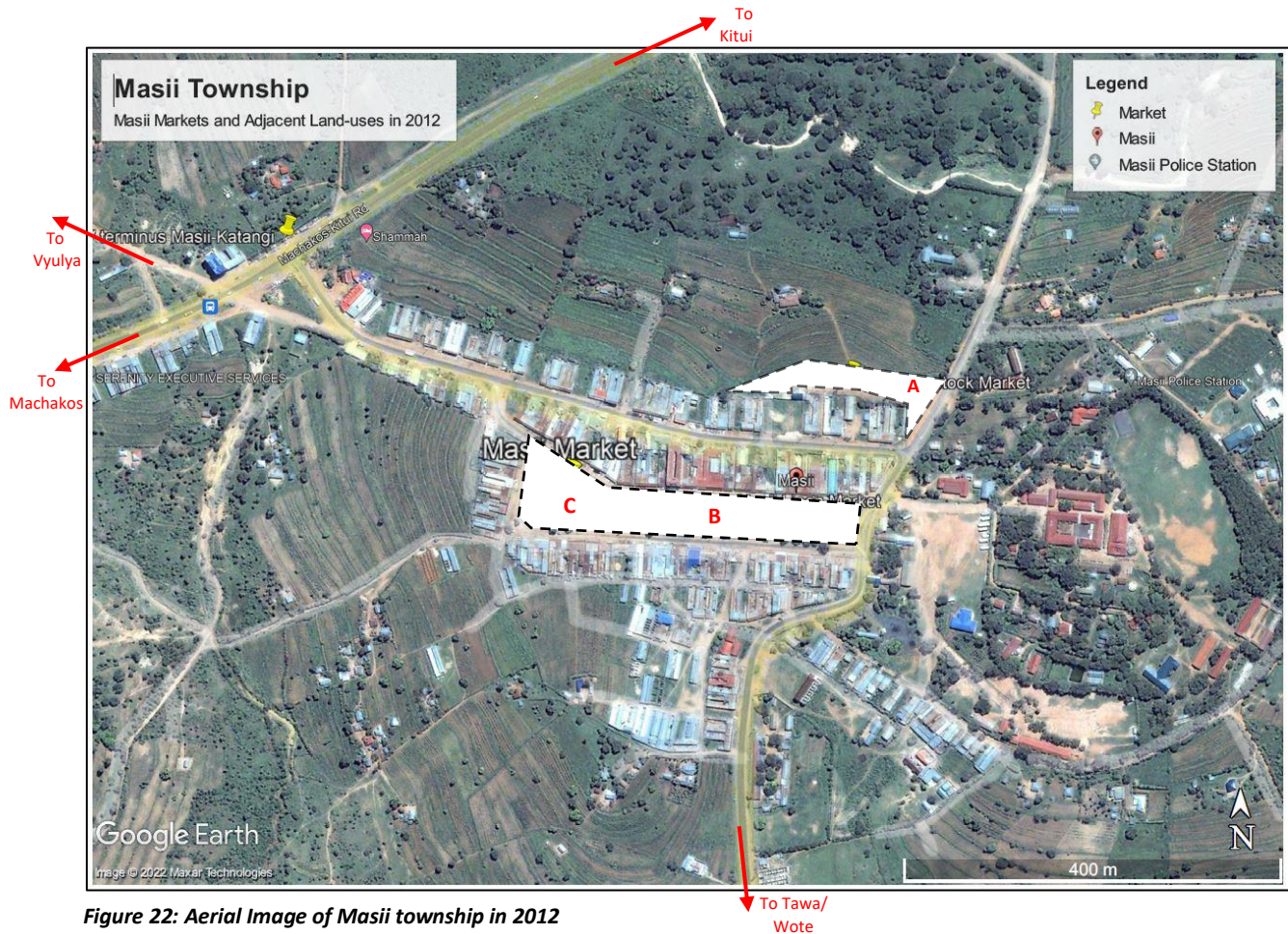


Figure 22: Aerial Image of Masii township in 2012

This transition period experienced in Masii township in line with the Kenya constitution 2010 brought in a lot of structural reform. This period created room for uncontrolled development as with the change in local government the plans previously used by the physical planning department had to be revised to suit the government structure instituted in the then-new constitution. Physical Development plans and development control guidelines for the township were since archived and no new plans or even attempts at refurbishing the old ones have been made. As shown in figure 22, the change had already started following the land-use plans given by the previous planning dispensation that had separated the markets. The food and linen markets were at this time separate entities with different access points, construction and management. The livestock market had been issued a site-specific definition. The breakdown is as follows using the labels on the figure above:

A: **Masii Livestock Market** was conferred within a definitive boundary. Trade of livestock increased significantly. The catchment area was expanded due to the improved road network with animals being brought in from further in the rural hinterlands and the output going further out regionally attracting more interest from external markets. Masii remained a focal intersection for Machakos, Makueni and Kitui counties. Only this time, the relationship evolved with the perceived interpretation of the novel governance system in place. Masii becoming the sub-county headquarters for Mwala sub-county

increased the interest in the township. This, resulted in significant growth in the physical development of the township.

B: Masii Food and Linen Market remained enclosed within the square under the new county administration, framing the market using inward-facing stalls and a wall indicating the perimeter. These stalls however proved inadequate leading to the encroachment into what was previously the open-air market. As illustrated in figure 23, the market was thereby defined by temporary stalls erected for the purpose of trade during market days. This informality was allowed by the local administration, as it created grounds for increased revenue collection.

C: Masii open-air market as was previously used by food and linen traders during market days, the market slowly took in more development to a point of saturation. As shown in figure 23, the former open-air market functions as an extension of the food market with informal stalls established within it. The market is not enclosed. It is defined by the road on three sides. It remains ‘open-air’ by definition as the developments as neither formally recognised nor are they permanent.

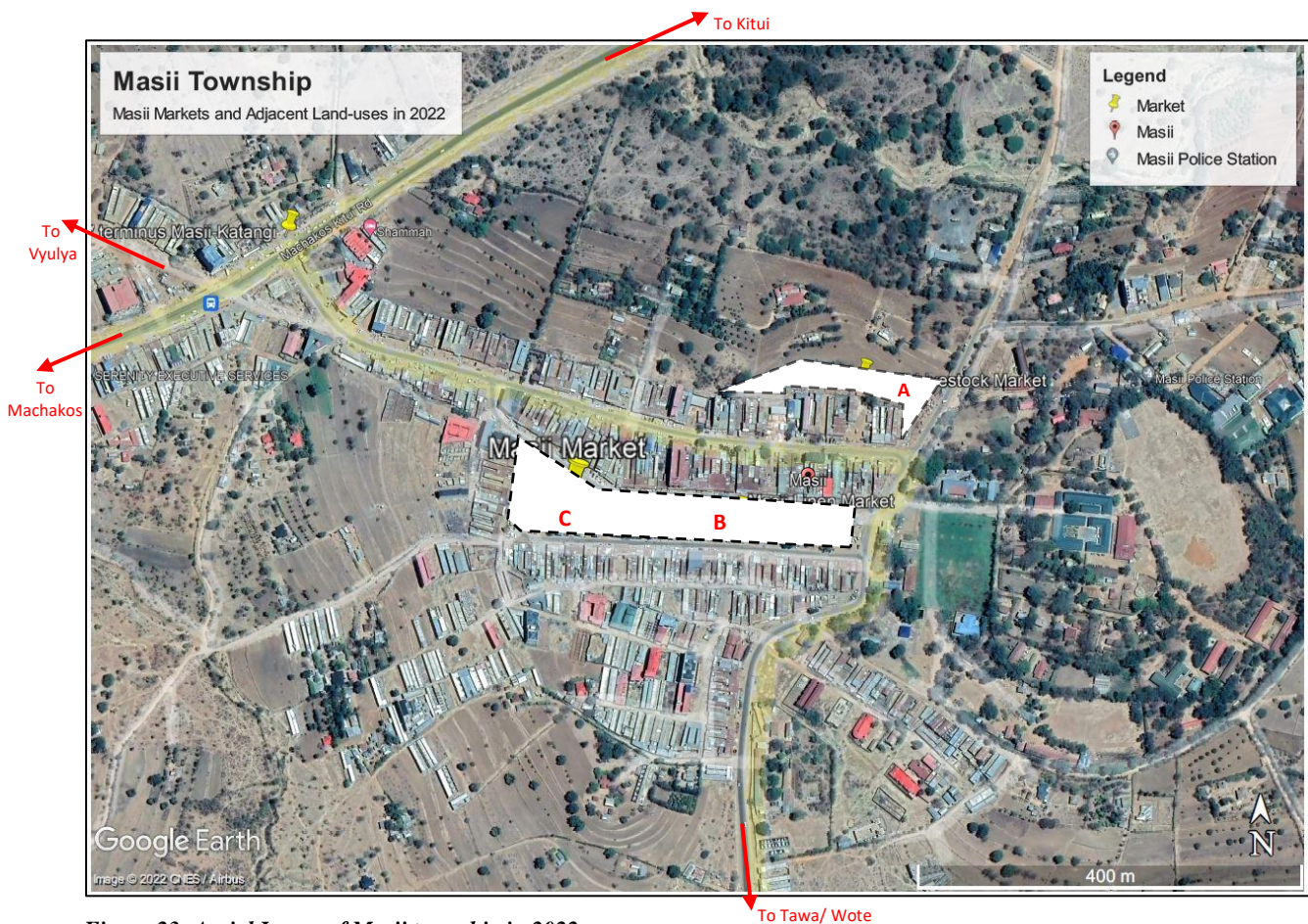


Figure 23: Aerial Image of Masii township in 2022

5.1.2 Trend Analysis of Wamũnyũ Market Centre



Figure 24: Aerial Image of Wamũnyũ Market centre in January 2003

Wamũnyũ market centre exists as a by-product of the periodic farmer’s market. The centre comprises stores and shops along the road that defines the Wamũnyũ market as shown in figure 24 above, with a slight linear deviation along the Wamũnyũ-Kilembwa road. Historically this market is known for its renowned woodwork, globally celebrated as ‘Kenyan’ artefacts. The timber sculptures, wooden carvings and art derived, are important outputs for this market. Consequently, craftsmanship in sculpture artistry has remained unique to this area over time. As a market centre for food and livestock, Wamũnyũ market centre has a market day on Tuesday.

The primary output of the market is agricultural produce; which encompasses food and livestock. The regional context dominantly participates in animal husbandry, with locals keeping: **bovines** - particularly bulls and steers for drawing carts and for ploughing; **goats** - mostly for meat, hardly ever for milk as the sector is severely undeveloped; **free-range chicken** - for meat and eggs; **donkeys** - for drawing carts, ploughing and carrying water. With the continuous effects of climate change, the region suffers from food

insecurity. The climatic conditions have continually resulted in longer, drier and hotter spells of drought. This increases the dependency on in-bound food from outside due to inability to produce crops locally. The climatic data is accounted for in table 2 below.

Table 2: Climatic data for Wamunyu Ward, Mwala Sub-County, Machakos County

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C	30.42	31.43	30.42	29.4	26.36	26.36	27.38	28.39	28.39	29.4	27.38	27.38	31.43
Average high °C	24.75	26.13	26.13	24.24	22.97	22.64	22.74	23.42	24.95	25.52	23.68	23.48	24.22
Daily mean °C	21.15	21.98	22.43	21.2	19.92	19.28	18.99	19.6	21.05	22.24	21.1	20.62	20.8
Average low °C	15.82	16.63	17.77	17.47	15.92	14.47	13.86	14.65	16.04	17.65	17.43	16.51	16.18
Record low °C	11.15	12.17	13.18	9.13	10.14	9.13	9.13	10.14	11.15	13.18	7.1	9.13	7.1
Average precipitation mm	76.46	94.16	143.97	207.36	101.11	37.42	22.54	22.88	24.1	73.53	204.28	167.95	98.01
Average precipitation days (≥ 1.0 mm)	12.91	12.35	18.62	24.61	21.47	10.88	7.01	7.1	6.45	14.84	25.62	21.47	15.28
Average Relative Humidity (%)	74.36	70.44	72.72	83.32	84.07	78.47	73.28	69.45	66.66	68.09	81.61	83.4	75.48
Mean monthly sunshine hours	11.4	11.34	11.14	10.88	11.05	11.28	11.18	11.44	11.43	11.57	10.93	11.32	11.24

Adopted and modified from: <https://tcktck.org/kenya/machakos/wamunyu#t2>

With the decreasing amounts of precipitation experienced and the increased number of hot and dry months, the decline in agricultural production has become inevitable. The dependence on livestock as the primary agricultural output is continually increasing as the shorter spans of the low quantity rainfall is said to be unsustainable for feasible crop production. This has resulted in decreasing rural population in the region which directly and indirectly affects the recycling of currency in the area. Consequently, this has seen the stagnation of physical development within and around the market.

While changes within the market are minimal, as seen in the trend analysis above, physical changes in the natural environment are glaring. The encroaching desert is further aggravated by the continuous felling of trees in the region for fuel wood, art and construction. The burning of charcoal for sale is increasingly becoming a popular alternative for economic empowerment. Lack of other sources of income creates a situation that threatens the natural environment, as the people require immediate sustenance regardless of long-term consequences. Efforts to mitigate against desertification, albeit incredibly negligible, prove even harder due to inadequate information by the so-called external experts on the propagation of indigenous trees in context. The unique local challenges make the idea of reforestation a complex balance. This is due to: the infestation of **termites**, which destroy tree seedlings in their earlier stages of development; and **unsustainable rainfall** patterns which make it difficult to naturally propagate the trees necessitating continuous watering of the trees in their formative stages which takes months in this region. This conveys momentous labour and financial implications to the already strained farmers. The water used to irrigate these trees requires to be moved from the source, using human labour and a donkey or ox-

pulled cart; and in some cases, it has to be procured by the jerrican. This translates to hefty financial obligation, revenue which is already considered fleeting for the marginalised region.

The local population depends on food brought in from neighbouring regions, especially from areas abutting River Athi where irrigation takes place, and also from external sources and markets as with the case with the periodic farmers market. Water shortage is very common in the region due to a lack of water pans within the area. While the use of groundwater has gained popularity over the years, sustainability in its utility remains unsubstantiated. The water is used primarily for domestic purposes. For irrigation, however, it proves problematic due to the high saline levels which alter the soil composition whereby. When used for irrigation, the water causes the soil to deteriorate in value as the saline water causes a change in pH level. The open lands neglected from farming become grazing lands, upon which the locals set their livestock. The herds are however also regulated due to uncertainty in water availability in dry months and the shortage of animal feeds which has historically seen mass death of livestock in the area. The local community has a relatively active poultry production and markets which supply to the larger south-eastern Kenya region as well as to other external towns, including Nairobi. This is aided by the fact that the local population maintains free-range breeds of poultry which hold fewer responsibility on the farmers, making it easy to maintain a substantial flock with ease and at minimal expense. This supplements their income.



Figure 25: Aerial Image of Wamunyu Market centre in January 2012

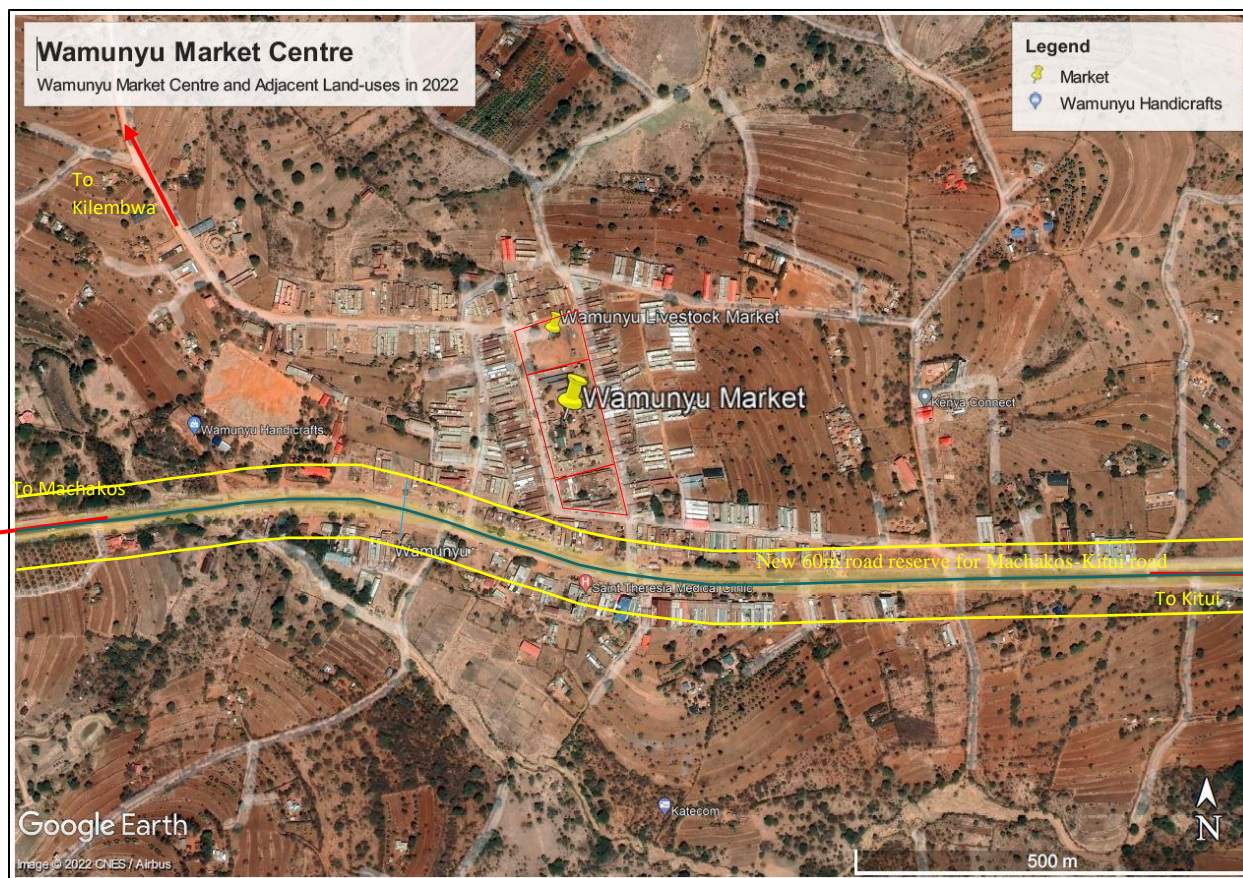


Figure 26: Aerial Image of Wamunyu Market centre in January 2022

Low precipitation has resulted in the movement of numerous able-bodied workers from the rural hinterlands to urban areas in search of better living standards and livelihoods to support their families. This has seen to increase in neglect of the previously productive agricultural land masses. As seen in figure 26, the dire situation created by the elongated drought periods makes it difficult to consider agricultural production as conventional.

The market centre is dependent on inbound traffic for food supply. However, poor planning of the market centre leaves a lot to be desired. This is due to inadequate sanitation, lack of potable water, poor waste management, lack of designated animal stations for the livestock market, poor road surfaces resulting in heavy dust during dry periods and intensive erosion during the rain periods. This is in addition to a lack of a wholesale/ bulk-trade section within the market resulting in conflict in land uses. Additionally, the more recent challenge was created by the expansion of the Machakos-Kitui road from a 30m road reserve to a 60m road reserve. The implication to this market centre is the inevitable displacement of buildings for the road as indicated in figure 26 above. This creates a need for a comprehensive analysis of the market centre as an individual entity and conscious denotation of land uses.

5.1.3 Trend Analysis of Katangi Market Centre

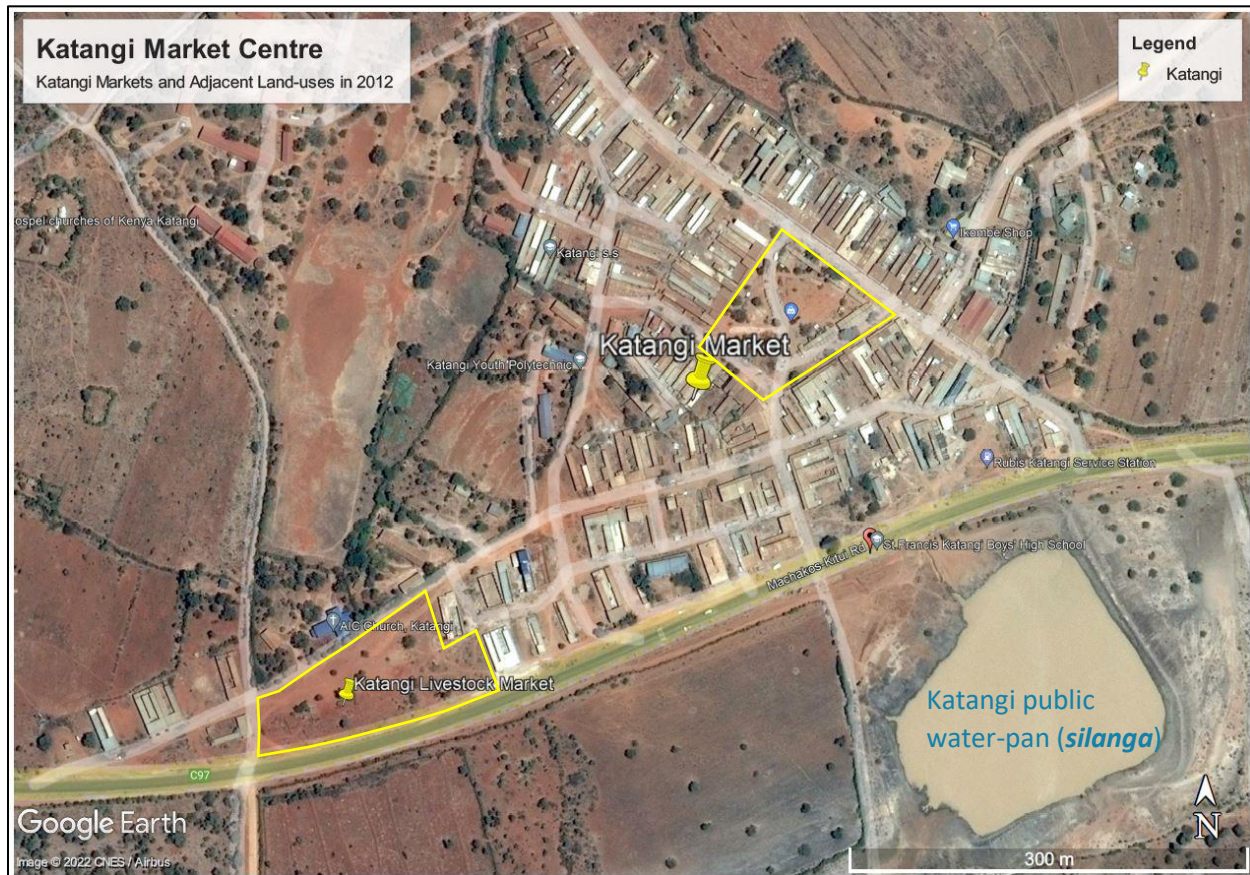


Figure 27: Aerial Image of Katangi Market centre in January 2012

Located 15km along the Machakos-Kitui road east of Wamũnyũ market centre, 33km Masii from Masii township, Katangi is the smallest of the three market centres in the periodic circuit. Spatially undefined, this market is located in one of the drier parts of Machakos county. This is noteworthy as it has implications for agricultural output, which impacts food security in the broader region and an unhealthy dependence on food imports. The market area is defined as a combination of clustered buildings clumped together for trade as illustrated in figure 27 above. The nature of this centre is unlike any other periodic market within the region as the main focus is not solely on food, but rather on general commerce. Katangi exists in a marginalised area, thus limiting the spatial scope, but also maintaining its economic importance to the region it serves. The space allocated to the periodic farmers market is within the regular-day market which hosts all manner of activities. These range from wholesale trade, daily agricultural produce sales, trade in agricultural non-food products, small fast-food eateries, general purpose shops and kiosks and podiums for religious crusading, to state but a few. The spatial challenges are very elaborate with visible inadequacies all around. The market is constrained within this area, a factor that discourages traders from the periodic market to convey their produce in bulk to the market. This results in fewer traders from

outside the market catchment, creating unique dominance of traders from within the vicinity of the market centre.

Rain-fed agriculture may be a challenge, but that is easily remedied by the presence of river Athi. The river is a major source of food production. Its presence makes it easier to source fresh produce from the farms into the market, shortening the supply chain from farm to fork. This renders Katangi market the only, if at all, food secure market within the periodic farmers markets circuit, as a consequence of the faux-oasis created by the numerous nodal farmer-funded Athi river irrigation systems. A bizarre paradox, one might say. The high temperature, unreliable rainfall, and continuous solar radiation as shown in table 3 below standard conditions for optimal agro-industrial production with the aid of a reliable irrigation water source. Predictable weather, good or bad allows for predictability. A factor that bodes well for irrigation farmers.

Table 3: Climatic Conditions in Katangi, Yatta Sub-County, Machakos county

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C	30.0	31.0	30.0	29.0	26.0	26.0	27.0	28.0	28.0	29.0	27.0	27.0	31.0
Average high °C	24.41	25.77	25.77	23.91	22.66	22.33	22.43	23.1	24.61	25.17	23.36	23.16	23.89
Daily mean °C	20.86	21.68	22.12	20.91	19.65	19.02	18.73	19.33	20.76	21.94	20.81	20.34	20.51
Average low °C	15.6	16.4	17.53	17.23	15.7	14.27	13.67	14.45	15.82	17.41	17.19	16.28	15.96
Record low °C	11.0	12.0	13.0	9.0	10.0	9.0	9.0	10.0	11.0	13.0	7.0	9.0	7.0
Average precipitation mm	75.41	92.87	142.0	204.52	100.05	36.91	22.23	22.57	23.77	72.52	201.48	165.65	96.67
Average precipitation days (≥ 1.0 mm)	12.73	12.18	18.36	24.27	21.18	10.73	6.91	7.0	6.36	14.64	25.27	21.18	15.07
Average Relative Humidity (%)	73.34	69.47	71.72	82.18	82.92	77.39	72.28	68.5	65.75	67.16	80.49	82.26	74.45
Mean monthly sunshine hours	11.24	11.18	10.99	10.73	10.9	11.13	11.03	11.28	11.27	11.41	10.78	11.16	11.09

Adopted and modified from: <https://tcktck.org/kenya/machakos/wamunyu#t2>

This allows for the existence of numerous farmer-driven agricultural initiatives which are seen to contribute significantly to the market's food supply. That, however, still does not remedy the low purchasing power of the locals, as most of the farms are run by outsiders. But it is a start. Due to marginalisation and food insecurity throughout the rural hinterland, this market is a lifeline for the residents of the region. It creates a somewhat reliable source of food for the catchment area as it is a central collection and distribution point for food and a social centre for those who need it.

Traders from outside avail smaller quantities of produce, another consequence of the lower purchasing power of the residents, compelling them to gauge their supply to avoid extraneous transport costs and risks of produce loss. Added to the restricted space, Katangi markets face strong challenges of institutional neglect from the county government of Machakos. The market lacks potable water; sanitation facilities; has very poor planning within the market and the market centre resides on treacherous terrain

with dense rock out-crops. Katangi market centre has underdeveloped road connections and poor drainage facilities; has poor waste management systems as well as an ironically non-existent livestock market, whereas livestock trade is a weekly economic activity. The Katangi livestock trade takes place on the fringes of the market centre, on a wasteland due to its intricate physical characteristics.

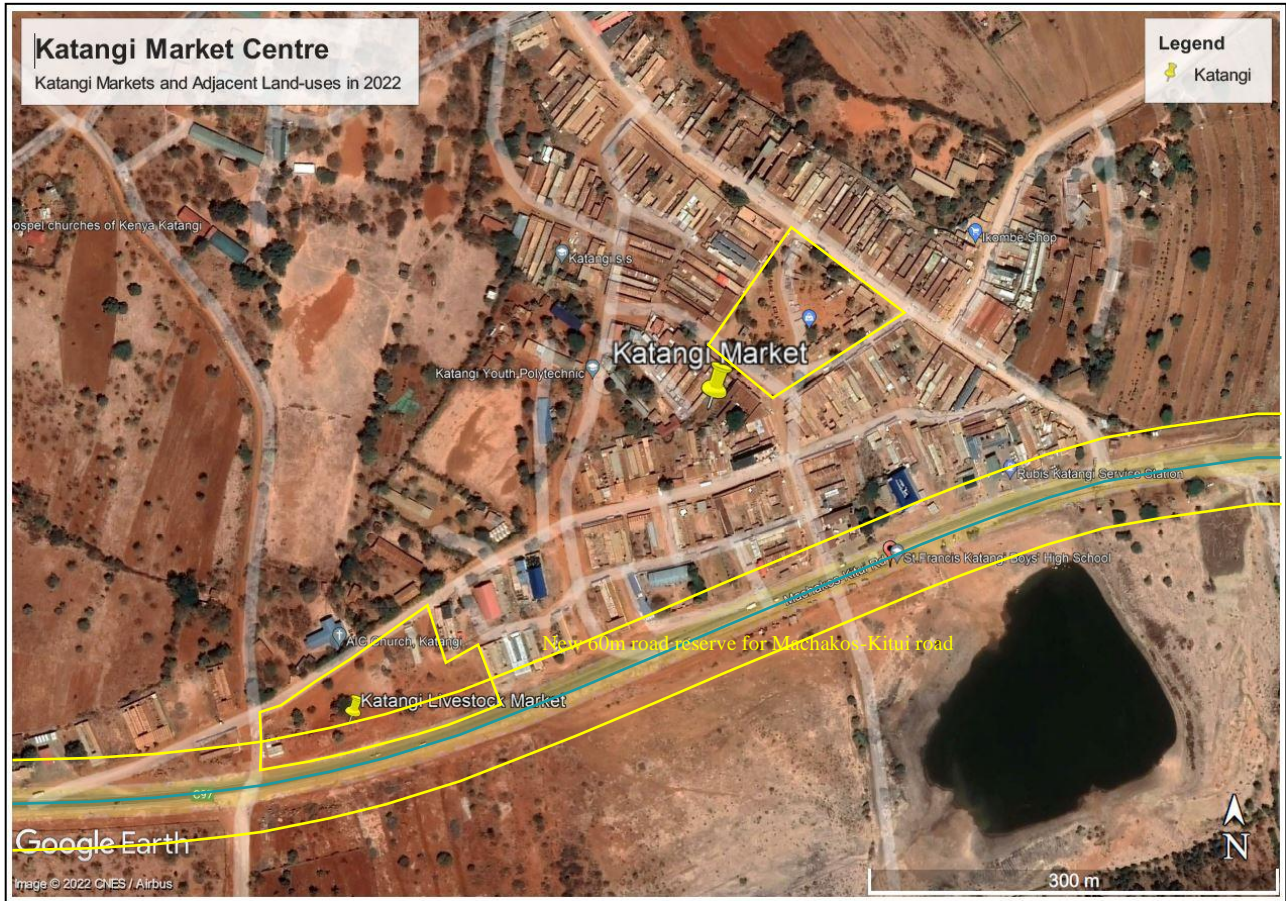


Figure 28: Aerial Image of Katangi Market centre in January 2022

The local arrangement has been an unlikely success over the years. However, a new constraint has taken root in the face of the expanded road reserve for the Machakos -Kitui road. This renders the market obsolete as half of its already limited space is absorbed into the road reserve as seen in figure 28. The limited market size as a consequence of development clutter becomes even more difficult to regulate. While the county government of Machakos is responsible for development control, the lack of a Physical Development Plan for Katangi gives wiggle room for unsubstantiated urbanisation. As seen in the 10-year time-lapse, the minimal change in physical development is indicative of developmental stagnation. This has its demerits in that it shows that the market centre is not growing horizontally. It however bears the unique position of delineating the expanse of the market centre indicating the potential for future planning and development control.

5.2 Findings of Objective 2: Assessing the Contribution of Periodic Farmers Markets to the Local Economy

Machakos county is geographically considered a semi-humid/ semi-arid area. Its unique location between the cool and wet central region in the northeast and arid semi-arid hot and dry counties to her southeast creates diversity in the extent of geographical location. The higher altitude areas within Kangundo and Kathiani Sub-counties, shown in figure 29 below, create a conducive environment for rain-fed agriculture. However, this is limited to climatic conditions. Lower altitude areas of Mwala and Yatta, which form the backbone of this study stand at a severe disadvantage when considering agro-industrial potential and capacity. Thereby necessitating the need to harness surface run-off for irrigation farming, as well as utilising the seasonal rivers that traverse the region. These seasonal rivers originate from the highland areas but are only sustained about for about a month after the rains, after which they revert to being dry river valleys, called **laghas**. These laghas contain sand and silt deposits, that if left untampered with, retain groundwater for approximately four months after the rain, at accessible levels within human reach. However, sand harvesting for use in construction depletes the holding capacity of groundwater, which exacerbates the depletion of the water table, threatens the capacity to replenish the aquifers, further worsens the droughts and upsurges the regional water insecurity crisis.

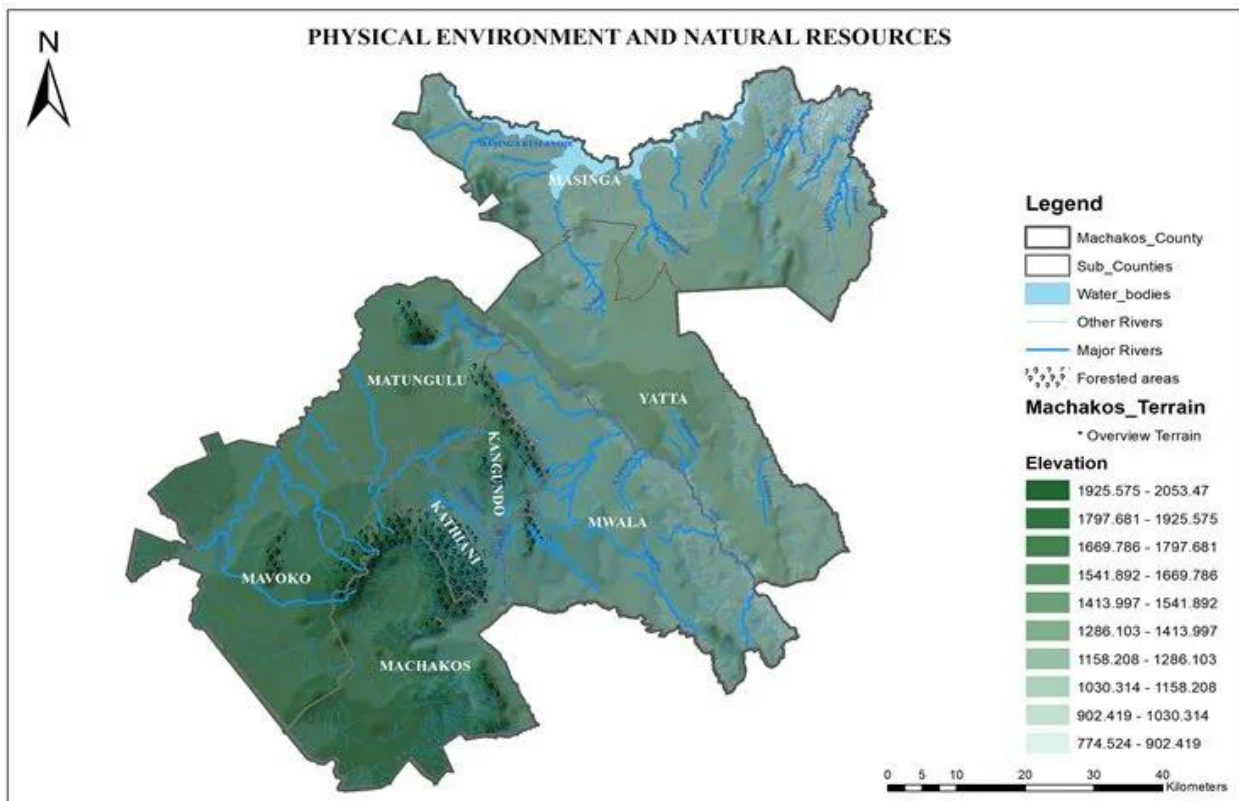


Figure 29: Physical Environment and Natural Resources in Machakos County

5.2.1 Food Production Dynamics in Catchment Area

Food security has been a matter of human concern throughout recorded history. So much so that it defines the very existence of all human civilisations in the scattered records of humanity's 750,000years¹³ of existence on the planet. As the climate is always changing, dynamics of what grows where, and how it is grown as well as the technology to facilitate these activities make up a significant portion of life as we know it. Agriculture is, in its very basic form, the backbone of human life, population increase, and socio-economic diversity. Therefore, the ability to ensure food security is vital to any populated area.

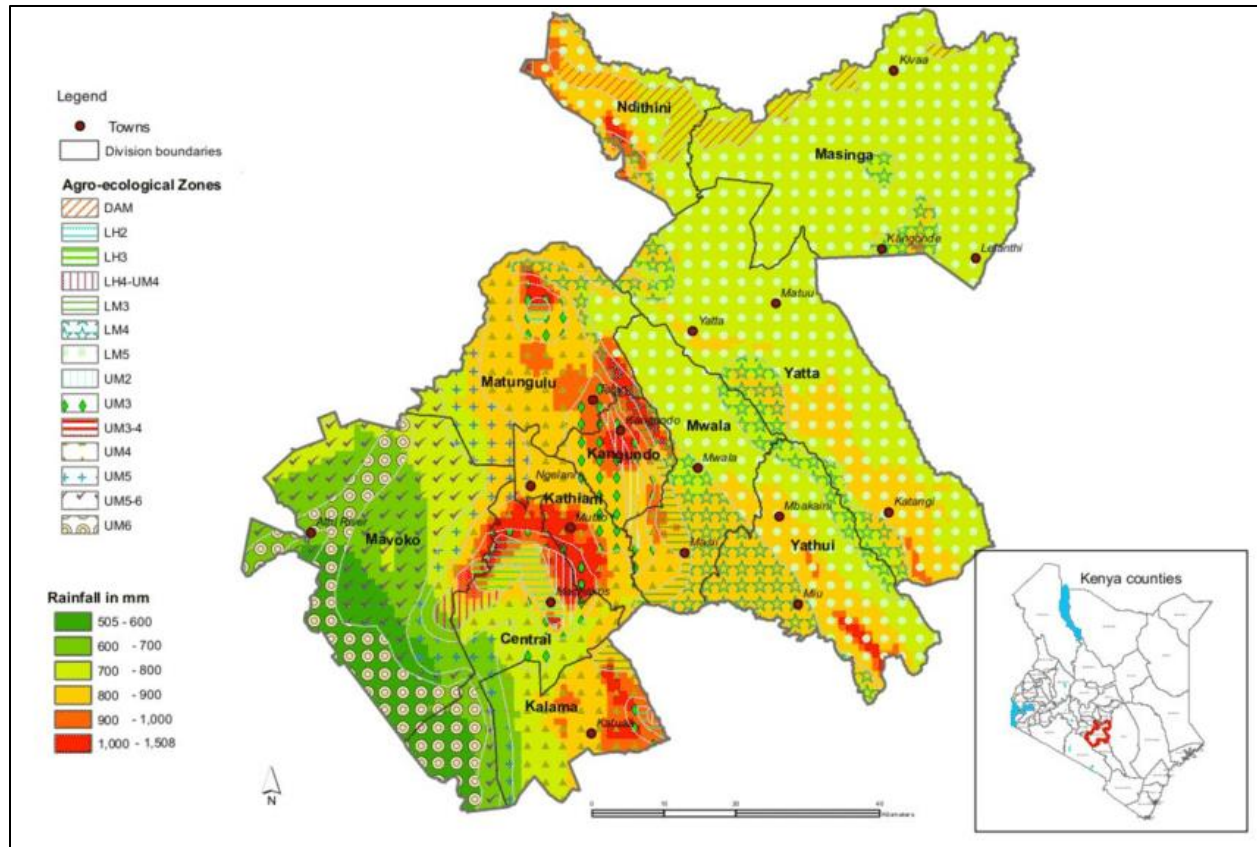


Figure 30: Agro-ecological zoning of Machakos County

Machakos County has small clusters of agriculture potential within the higher altitude areas. However, these areas are few and far apart and the rain is both unpredictable and undependable. As shown in figure 30 above, the scattered distribution of agroecological zones makes it harder to propose a regional agro-industrial agronomical system. The different soil characteristics, prevailing winds, temperature and rainfall patterns, proximity to alternative sources of water, groundwater conditions, delicate ecosystems and geographical positioning, curtail agricultural capacity. This alters food production dynamics in a way that necessitates native knowledge of the land and local food systems for any semblance of planning to

¹³ <https://www.smithsonianmag.com/science-nature/essential-timeline-understanding-evolution-homo-sapiens-180976807/>

take. The study area exists within a seasonal semi-arid stretch in the south-eastern part of Machakos county. This results in the adaptation of food cultivation to mostly the wetter months which is due to the regional dependence on rain-fed agriculture. This results in a need for diversification of food sources to meet food needs. Food grown and/ or produced all over the country and even around the world eventually finds its way into the markets in the region.

Kenya as a country only accounts for 10% of arable land, which is incontestably seen to diminish as a result of land fragmentation and rapid change of use. This however creates compelling arguments for agricultural diversification and revolution. The sources of food are again determined by the types of food produced. This is due to the protein and starch-based staples which dominate the nutritional bias in Kenyan households. Such include: *cereals* - maize, wheat, rice, sorghum, millet; *pulses* - beans, peas, soy, green grams; *green vegetables* - spinach, kale, amaranth, nightshade, cabbage, stinging nestle among a host of other indigenous flora; *fruit vegetables* - capsicum, tomato, cucumbers, aubergine, pumpkin & squash, *animal products* - milk, eggs, fish, chicken and beef; *tubers* - potatoes, yams, arrow-roots, sweet potatoes, cassava; *bulbs and rhizomes* - onions, garlic, ginger, turmeric, ginseng; *culinary herbs and spices* - coriander, parsley, leeks, oregano, peppers, cumin and cinnamon, to state but a few. Mapped out, these makeup about 78% of foods sold in the periodic farmers markets within the study area.

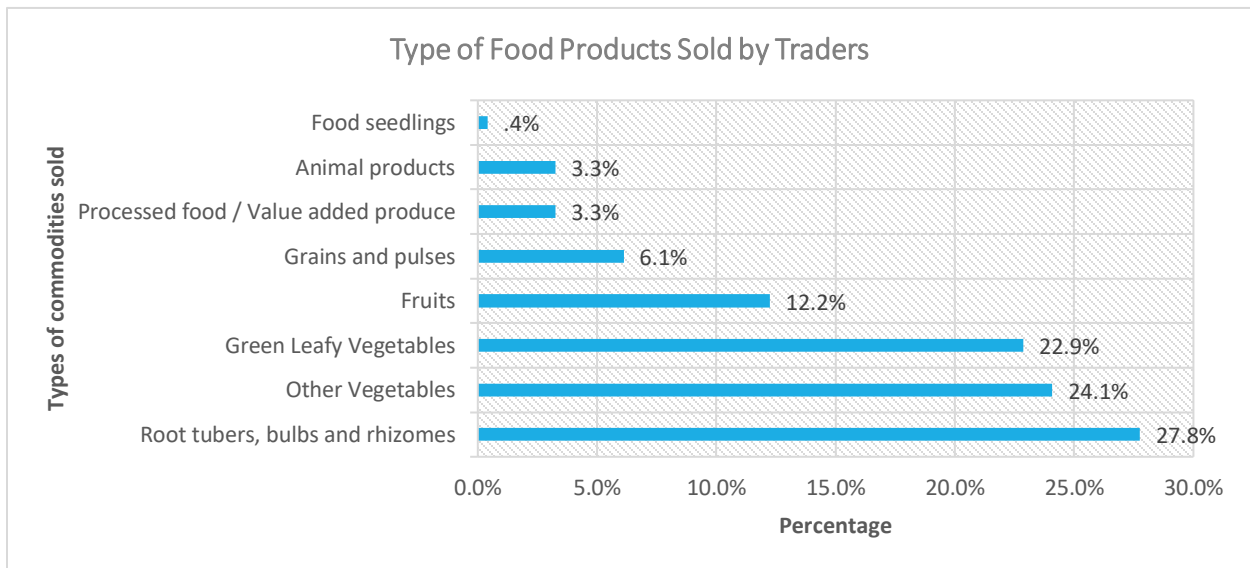


Figure 31: Frequency of Agricultural Produce Traded

This agricultural produce in trade within the study is determined by a number of factors. These include prevailing climatic conditions; availability of food within the vicinity of the markets and the catchment areas; road conditions connecting other food-producing areas; energy/ transportation costs in the country; cereal-harvest booms in neighbouring counties; drought in neighbouring food-producing counties; and trade agreements with neighbouring countries in the East African Community to state but a few. These

determine the embodied energy for the food which directly impacts the costs. The choices available create room for alternatives in food systems and compel adaptation by local consumers. Prevailing climatic conditions in Kenya are categorised as wet or dry. In Machakos county, this can be broken down into 4 overall seasons, two dry seasons, a long rainy season and a short rain season. During the wet season, short-term crops are cultivated in all rural agricultural homesteads. This creates a provision of green leafy vegetables, pulses, rhizomes as well as herbs and spices. The increased local production dissuades traders from trading in certain commodities in some areas due to the proximity of farms and reduced demand. This causes a change in market dynamics as the products available in the market evolve with demand and supply. The traders also tend to find convenience in this as it allows them to procure various goods locally and around the proximal region and then trade in other urban centres which may have food insecurity.

The source of food bought in by the traders during wet seasons is disproportionately biased towards

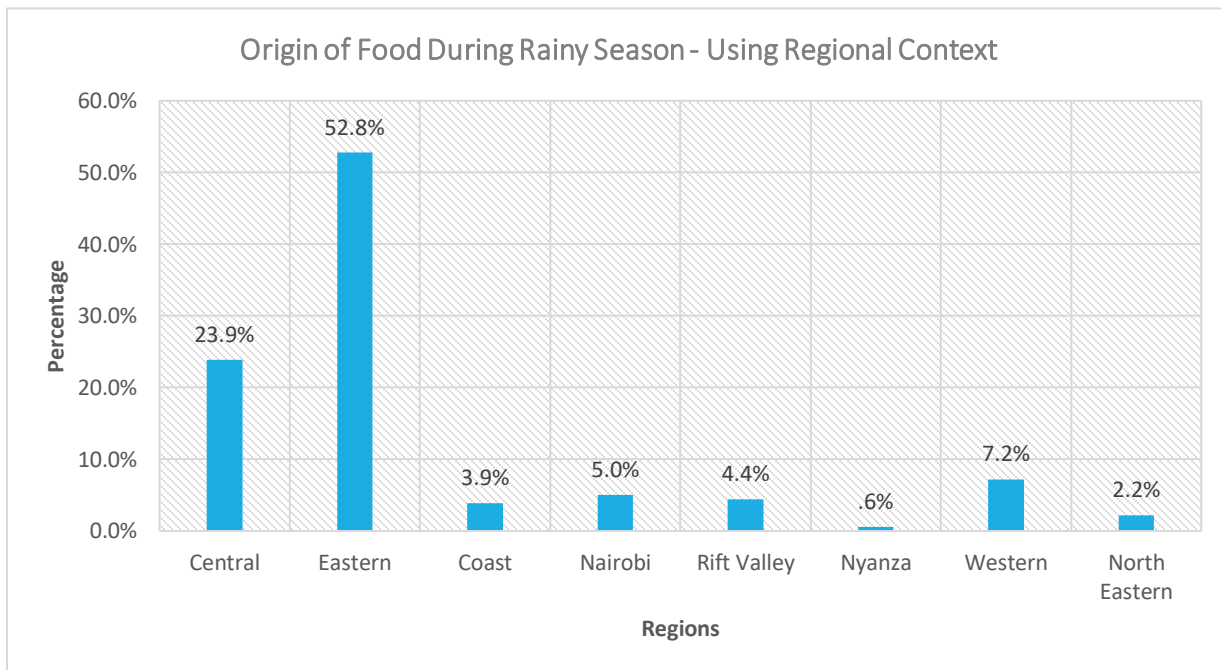


Figure 32: Source of Food in Markets During Rainy Seasons.

Machakos and neighbouring Embu and Kitui counties as part of the former Eastern province as seen in figure 32. These include fruits and vegetables that can be locally sourced as well as animal feeds derived from the same. Though diverse in the selection, these foods only comprise a relatively small portion of what is locally consumed as not all food, regardless of rain, can be grown within the region. Therefore, some food products like *tubers* - potatoes, sweet potatoes, carrots, arrow roots, and yams; *vegetables* such as cabbages, capsicum, aubergine, and cucumbers and non-citric *fruits* – bananas/ plantains, tree tomato and seasonal fruits are still procured from the wet highlands of Nyeri, Kirinyaga and Murang’a counties.

Some food products have readily available alternatives making them easily replaceable in the advent of short-term crops such as onions, but the dominance of the product in other regions makes it eerily more attractive to outsource them rather than produce them locally and on a small-scale. This brings in other stakeholders as in the case of onions which are produced in bulk in Kajiado, Narok and Nakuru counties within the Rift-Valley region and also imported at relatively lower prices from Tanzania through Kajiado.

The conditions of these food products noteworthy as production and storage characteristics determine the self-life of perishable agricultural produce and the distance from which it is sourced. Traders traverse the country with food products with longer shelf-life as in the case of sugar cane, plantains and yams from Busia and Kakamega counties. Bulk traders operating in lorries and transit trucks however source food from all over the country. The variety of food products might be limited to staples like cabbage, tomatoes, green maize, onions and bananas but the source and destination differs depending on the available market. They procure the goods from various farmers in diverse parts of the country and use a strategic food market system locally engineered to trade their goods at an optimal profit. While considered primitive and rather opportunistic - as this technique has been known to create artificial food shortages and also flood markets to disrupt trade and destroy local food trade - this is a classic example of meticulous food needs matrix planning and consumer mapping. The fluctuation is illustrated in figure 33 below. During the drier months, the consistency of food production is broken due to the drought. Therefore, with the onset of the hot and dry season deficiencies exist in the availability of certain commodities, especially the vegetables. Harvesting of cereals and pulses as well as citric fruits happens during drier months which is indicated by an influx in the trade. However, green vegetables and fruit-based vegetables are usually in lower local supply during this period. The traders indicate that food sold during drier months differs significantly

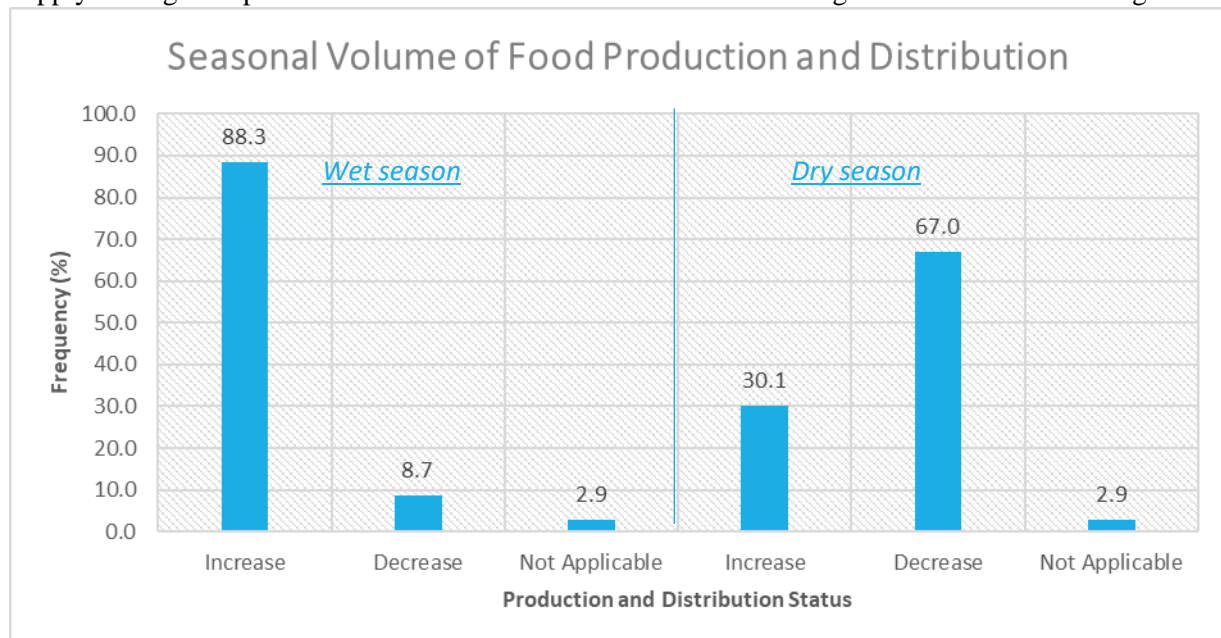


Figure 33: Fluctuation of Food Production Depending on Seasons

from those sold during wetter months. This is because some of these products are sourced further away from the market, and as a result of the distance, perishability is a very important factor. Thus, highly perishable goods are more often than not excluded from inventory as they result in significant waste and losses due to the high temperature, time-lapse from source to consumer and risk of demand fluctuation. Therefore, the variety of some products such as green vegetables is limited to cabbages, brought into circulation from producers in Kiambu, Murang'a and Nyeri counties in the central region and Nakuru county in the Rift Valley region. The unique situation created during the dry seasons results in the creation of food deserts in rural areas where food security is considered to be under threat. This results in the reliance on markets in urban areas as both regional collection centres and food sources for rural areas.

The rural-urban linkage during these months is delicate as the exchange is considered strenuous for farmers relying on rain-fed agriculture. This is because the need for markets increases significantly due to the deficiency of certain food types in the homesteads. Coincidentally, fruits are often very abundant during this period. The produce from the locale changes and the market dynamics are altered as the balance of trade becomes a symbiotic exchange. Fruits are sold in plenty and at significantly lower prices as the supply is high, while the vegetables are limited due to the nature of their acquisition thereby increasing their cost. This is indicated in figure 34. The scale of trade is an important component in the markets. As they are mostly meant to serve the rural hinterlands, periodic markets attract traders of various socio-economic status and capacity. So, farmers bringing in goods from their farms, from the smallest market-value production to large-scale farmers who trade wholesale. Then come in the transit

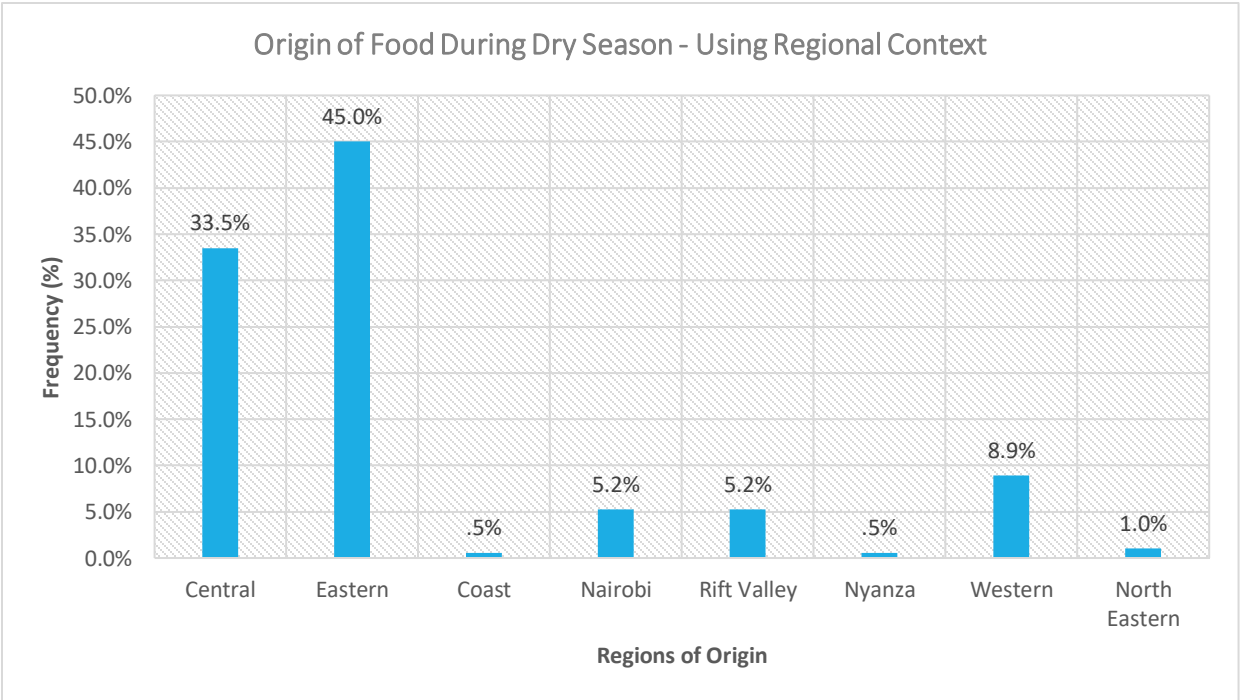


Figure 34: Source of Food in Markets During Dry Seasons

traders that ferry goods from county to county with the aim to distribute products bought in bulk from other regions to supplement local supply. While it is very conducive for the purpose of food security this can create a shadow effect on the small-scale farmer-traders who are compelled to adhere to the influx of foreign goods competing with local production. The traders are given freedom of association and of trade allowing for the out-sourcing of produce. The kaleidoscope of food sources diverges depending on the types of products being sold, the prevailing demand-supply conditions as well as the preference and the purchasing power of the consumer. The sources of food available to the traders give an idea of the food production, regional connectivity, dependence and food security indices of an area.

5.2.2 Livestock trade and Periodic Markets

While the idea of periodicity in farmers markets is enshrined in rural development and quite common in Kenyan rural hinterlands, trade in livestock cements the idea of a trade route in the Masii-Wamũnyũ-Katangi periodic farmers market circuit. A market day is commonly so referred to and respected due to the presence of a livestock market in that market centre on the specified market day. As a substantial contributor to local agricultural production, due to the restrictive climatic conditions, duality of purpose in animal breeds, secondary benefits of livestock farming in mixed agriculture and the ready income from livestock husbandry, the aforementioned periodic markets become all the more significant a planning factor in the design and designation of periodic farmers markets. The commonest livestock kept and traded in the aforementioned periodic markets include: *cattle*, *donkeys*, *goats*, *sheep*, and *chicken*. The trade of livestock varies significantly depending on: the context; local needs matrices; prevailing weather conditions and seasons in the year; availability of animal feed and water; the Kenyan school calendar; Abrahamic religious holidays and the availability of demand from neighbouring larger towns.



Plate 1: A cattle cluster comprising young bulls in Masii Livestock market. Image taken: 11/04/2022

5.2.2.1 Masii Livestock Market

Care for livestock and trade is a delicate endeavour. Unlike in food trade, live animals require timely decision-making when planning for, with continuous adjustments and systematic interaction to avoid incidents, destruction, panic attacks, fear, stampedes and even death of both animals and handlers.

Livestock markets are set to accommodate various animals of different sizes, breeds, physical conditions and purposes for trade. For cattle, separation is done by:

Gender - to avoid interbreeding, sexual assault or physical injury for in-calf heifers in the markets, the bulls are separated from the heifers in clusters.

Size - to protect the younger cattle as shown in plate 2, from being accidentally trampled upon, attacked or lost in the herds, this is also done for the purpose of pricing, where the bulk traders can give estimates for prices to the brokers who bring in customers from around the market.



Plate 2: Controlled clusters for adult bulls and steers for beef, as draught animals and for breeding. Image taken: 11/04/2022



Plate 3: Donkey clusters kept at the edge of the road outside and across the road from the market. Image taken: 11/04/2022

Status/ isolation – this is done for various exotic breeds which are clustered away from other herds. they are priced differently and are separated to avoid incidents as they are perceived to be delicate. In the case of **donkeys** and **mules**, they are separated from direct human contact as seen in plate 3 and from each other as they can cause injury to handlers and to each other from biting and kicking. Donkeys also have a standardised local market price making their sale a basic transaction unlike others.

Donkeys constitute a major part of regional identity, define convenience and are irreplaceable due to regional water scarcity. Donkeys are designated service animals. They carry water jerricans of up to 100 litres on their backs over long distances, draw carts loaded with heavy and bulky goods and are also used to draw ploughs, especially after long dry months when farmers indiscriminately dispose of their bovine herds. Donkeys are grazers, require minimal maintenance as far as pests and diseases are concerned and have a service life expectancy of 30 – 40years. The largest risk to the donkey population, which is in itself a **high risk to water security** and regional economic sustainability in the semi-arid area is the **Donkey Abattoir**. Donkeys have a long gestation period of 11-14months. And due to intense physical labour, only about 47% of donkeys in the region make it to full term. Replenishing stock becomes very hard when the animals are sold for meat. As a region, this has opened up a very severe crisis as donkey theft

has gone up exponentially. Unlike cows and goats, vulnerable families without a donkey in this arid semi-arid area will have to rely on human labour for the transportation of water. This promulgates cyclic poverty as the women and children, young girls especially, are compelled to spend hours fetching water during dry months regardless of school. This directly impacts school participation and capacity building in the already marginalised region.

Goats sold in the Masii livestock market are accorded different respect. As they are smaller and relatively easier to handle, they are only differentiated by the trader. For traders with larger herds, they are assigned specific areas by the revenue officers along the market boundary to tether their herd as seen in plate 4. This is done for the purpose of market management and in order to avoid mixing the animals. It allows for isolation and also gives rooms for traders to display animals selected from their herd by customers.

The constructed shed within the livestock market has been deemed an eyesore by the locals. As an investment in physical infrastructure for the market, it lacks structural integrity and functionality for the purpose it is perceived to have been. Lack of community involvement and public participation resulted in the installation of a structure whose form and ergonomics repel its function.



Plate 4: Goats clustered to the market boundary edge near market shed and tethered together depending on the bulk trader within Masii Livestock market. Image taken: 11/04/2022



Plate 5: Farmer-traders with smaller herds clustered inside and around the covered shed within the Masii livestock market. Image taken: 11/04/2022

It is used as a station by farmer-traders to sit under and also display their small herds for sale as indicated in plate 5. The farmers and consumers are relegated to buy and sell goats at designated stations assigned by representatives of the Machakos County Government Revenue Collection Department. The make-shift stations are designated for farmer-traders and small-holder traders during market days. The market system is in such a way that the open-air stations are free to display. However, a fee is levied on the trader for every animal sold. This levy is imposed upon existing the market. It is important to have an open display of the animals in the livestock market due to various reasons. These include the identification of stolen livestock, veterinary inspection as well as visibility and accessibility for both traders and customers. The trade of goats in the region is a delicate economic gamble. Due to their drought resilience, the sale of goat is considered seasonal. The population of goats in the market decreases during dry months as they are retained within homesteads as the sole source of income in case of emergency. The relatively high restocking rate renders them a viable investment in arid semi-arid areas. However, the decrease in open grazing/ browsing land creates a problem for conventional goat farming, as goats are known to be highly destructive. As browsers, goats tend to destroy trees and shrubs. They are known to escape often and are a source of conflict, especially in smaller spaces, due to high caloric intake and poor farming practices.



Plate 6: Sheep clustered to the market boundary edge near market shed and tethered together depending on the trader within Masii Livestock market. Image taken: 11/04/2022

Sheep sold in the market are designated to the farthest western section of the livestock market. Sheep are docile creatures that are often very calm once placed. As gregarious animals, they flock together and often remain so until they are sold or moved by traders as shown in plate 6. Farmers with smaller herds are allowed the capacity to display their herds along this section regardless of numbers, all tethered to the boundary fence. The sheep are all clustered together and branded by the traders for distinction. Trade in sheep is still underdeveloped in Machakos county and south-eastern Kenya at large due to the low demand for sheep and sheep products. This affects the market value and desirability of the animal for both traders and intended customers.

5.2.2.2 Wamūnyū Livestock Markets

Wamūnyū is regionally appreciated for its trade in **free-range chicken**. As part of the periodic livestock and food market, it has the largest poultry output of the markets along Machakos-Kitui road from Machakos town to Kitui town. This is owed to the high capacity for chicken rearing and the diminishing avenues for alternative agriculture in the region. The chicken market is however undefined. The birds are displayed on the ground along the highway as seen in plate 7 below, often under sheds or at the stoops of other business establishments along the road. Owed to the delicate nature of poultry farming, this indiscriminate nature of association for trade creates a situation which compromises the local chicken population. Meaning that these birds can only be considered for immediate slaughter and **not for rearing**.



Plate 7: Chicken farmers market along Machakos-Kitui road, Wamūnyū market. Image taken: 12/04/2022

While we acknowledge that the birds sold are of varying ages and more often than not, intended for various functions, it stands to reason that planning for poultry trade within the livestock market is a matter requiring meticulous involvement. Whereas the quality of the food from the stock sold may not currently be in question, possible contamination, as a result of proximity and lack of sterilisation of environments in which they are set, endangers the entire regional flock. This renders all the individual live chickens on display at the livestock market unsuitable for integration/ re-integration into chicken farms. This applies both to the customers who procure the birds for purposes other than immediate consumption and the farmer-traders who have to return home with unsold produce. This is due to poor farming practice which results in the spread of easily inoculable, highly contagious and deadly poultry diseases.

In Wamūnyū, **donkeys** play a very significant role as service animals. With the novel purposes such as meat and milk production recently introduced notwithstanding, donkeys are very versatile livestock. Due to handling issues, donkeys for sale are located away from direct contact in the livestock market. However, due to lack of planning and poor spatial allocation, as shown on plate 8, they are relegated to the wasteland in the market, which in this case is the garbage heap. As a consequence of bias in animal husbandry, this is unsanitary and potentially dangerous to the health of the animals. Wamūnyū market centre is not serviced with a waste disposal system of any nature or form. All solid waste from the market centre is congregated in this general area within the market centre and set ablaze, hence the wasteland.



Plate 8: Donkey trading section located on garbage heap in Wamūnyū Livestock Market. Image taken: 12/04/2022

During market days, this garbage area is used as a station for the donkeys on sale. The notion that donkeys are similar in form, stature and intention for use; added to the lack of variety for breeding, relatively large life spans and durability; negates the perusing done by customers as in the case with other livestock. This results in the dismissal of their spatial needs hence the deficiency in spatial allocation for donkeys within the livestock market.



Plate 9: Cattle clustered in by traders and farmers for trade in Wamũnyũ Livestock Market. Image taken 12/04/2022

Cattle trade in Wamũnyũ Livestock market stands complimentary to the Masii market. The animals sold on this market include herds from the Masii livestock market that were not sold the day prior; cattle brought in by farmers from the vicinity as well as bovines from neighbouring Kitui county. Unlike the focus on cattle for slaughter in Masii Livestock Market, cattle sold in this market are usually considered for restocking. These are often the dual-purpose varieties and more often than not, younger and smaller, as shown in plate 9. The prices for the cattle are less than for Masii Livestock Market, which includes animals that had been in Masii Livestock Market the day before. This is due to an assumption of lower purchasing power on the intended customers and in some instances fear of depreciated market value among the traders.



Plate 10: Goats tethered around boda-boda stand within Wamūnyū Livestock Market. Image taken 12/04/2022

Goats and **sheep** in the Wamūnyū Livestock Market are tethered together, as seen in plate 10. The existing stock for goats is often higher in this market than in Masii Livestock Market. As explained by traders, this is due to higher goat production within the rural hinterland and also due to high transportation costs. There is a larger percentage of *farmer-traders* in Wamūnyū Livestock Market with goats due to the ease of disposal and size of the commodity. As seen below, the trade of goats takes place in makeshift stations. In Wamūnyū, it takes place under a boda-boda shed. The population is controlled manually, with handlers in direct contact with the animals at all times. The Wamūnyū Livestock Market is undefined, unfenced and unplanned. It exists as an open field that is open for trade on Tuesday, from dawn to mid-day. During and after this, the open space doubles as a truck parking bay, a bulk loading bay, a boda-boda station and an open field for religious crusading. Planning for this space is quickly becoming a necessity as conflict in land use is slowly creating social strife in the market centre.

5.2.2.3 Katangi Livestock Market



Plate 11: Goat trade station in Katangi Livestock market. Image taken: 13/04/2022

The Katangi Livestock Market is the last periodic livestock market along the Machakos-Kitui road in Machakos county. It is spatially the smallest in size, and also the furthest farmers market along the transport corridor. As a livestock market, its trade in goats is the most vibrant. The climate is most suitable for keeping goats. They are best marketed due to their considerably better market value and efficiency for both the meat traders and the farmers. as seen in plate 11, goats are herded in clusters at various parts of the market. Unlike for Masii and Wamūnyū, the Katangi Livestock Market is not located within a market square, rather it is situated on the outskirts of the market centre on a field with rock outcrops adjacent to the highway on a slight elevation.

The donkey market is Katangi Livestock Market is significantly more vibrant in comparison to other markets in the periodic circuit. This is due to a higher need for the porter animals and the higher agricultural activity in the adjacent catchment area. Katangi market centre is uniquely situated close to river Athi, which motivates food and feed production. The demand for donkeys is therefore higher. As seen in plate 12 below, the animals are placed away from human contact on one edge of the livestock market.



Plate 13: Donkey trade in Katangi Livestock Market. Image taken: 13/04/2022

Cattle in Katangi livestock market are mostly from the rural hinterlands and the residue product of the animal stock from Wamūnyū not sold the day before. These bovines, as shown in plate 13, are often exhausted as they are moved on foot throughout the periodic system from market to market. It is an involving exercise and worse still for the animals, as those not sold during this market day have to walk back to Masii Livestock Market which happens the day after.



Plate 12: Cattle trade in Katangi livestock market. Image taken: 13/04/2022

5.2.3 Challenges in Livestock Markets

The periodic livestock market is the backbone of regional trade in Machakos County, as is the case in the entire arid semi-arid land area of south-eastern Kenya. Due to the low-income status of local farmers and the relatively low capital gains from livestock trade for small-holder farmers, some tradition remains with regard to the conduct of this type of trade. In this case, the movement of animals from one market to the next along the periodic circuit. Some related challenges were identified with regard to the handling.

5.2.3.1 Failures in Planning for Periodic Markets Resulting in Road Carnage on Public Roads

The distance from Masii township to Wamũnyũ market centre is 18km; from Wamũnyũ market centre to Katangi market centre is 15km. The distance from Katangi to Masii is 33km. Livestock not sold on the first market day of the week, Monday, in Masii are herded on foot to Wamũnyũ. In the event that they are not sold on the second market day, they are herded on foot to Katangi. And if on the third market day, they are not sold, they are herded on foot back to Masii for the fourth and last livestock market day of the week, Thursday. Bovines shown on plate 14 had endured 64.5km of travel in 3 consecutive days only to be massacred 1.5km away from the final market destination, upon which they would have either been sold or returned to their respective farms awaiting the farmer's decision. Road carnage is a recurrent incidence caused by a lack of designated animal crossings on the entirety of the 93km Machakos-Kitui road. This is mostly experienced between Masii and Wamũnyũ, which accommodates the largest animal exchange on the entire route. The crossing areas customised by the market-bound herders are at 3no. points between



Plate 14: Road carnage near Masii Town along the Machakos-Kitui road. Image taken: 28/04/2022

the Masii and Wamũnyũ stretch. These areas include constricted sections across narrow bridges, as in the case shown on plate 15. This particular incident resulted in the destruction of 4no. PSV and the death of 24no. market-ready bovines, an agricultural loss of estimated Kshs.1,320,000 - based on the prevailing market value at the time of incidence. While the carnage was caused by an overlapping PSV driver, the legal ramifications of this incident place the farmer-traders who own the destroyed bovine stock as the defendants. This is while considering that the incident was a result of a lack of designated animal crossing on the 60m wide inter-county road. The need for planning can neither be overstated nor overlooked in such an economically crippling repetitive occurrence of perennial death and loss of property, livelihoods and potential food in an already food-insecure region.



Plate 15: Road carnage near Masii Town along the Machakos-Kitui road. Image taken: 28/04/2022

5.2.3.2 Unethical Treatment of Animals



Plate 16: Inhumane treatment of livestock by brokers. Image taken 12/04/2022

Handling live animals, especially cattle would usually require patience, knowledge and precaution. This is while bearing in mind the dynamic conditions of sentient beings with cognitive understanding and the fight-or-flight response accorded all living creatures. That said, it is rather jarring to experience blatant disregard for life. Animals being openly mistreated and mishandled is unfortunately very common in livestock markets. As illustrated in plate 16, brokers use clubs and sticks to intentionally injure cattle, especially bulls for ‘ease of management’. They target the *cannon bone* and the *pastern* - the lower part of a bovine’s leg - to ensure that the animal is limping. The resultant pain reduces movement and makes the animals slower and less likely to interact or charge at other animals around, or so it is claimed. The risk to the handlers is often very minimal and is only collateral damage during the escape from an attack. The major risks to cattle are usually other larger more aggressive cattle and most notably the violent handlers in livestock markets. This requires remedying due to both social and economic ramifications.

5.2.3.3 Inadequate Site-Planning of Livestock Markets

As an entity for trade, the livestock market is an activity-intensive arena. There exists a movement of people; animals; vehicles for loading and off-loading; revenue collection by the county government; veterinary inspection of animals meant for slaughter as food for human consumption and transportation as well as the exchange of livestock between people as is the essence of a market of this nature. Lack of definition in terms of road access and spatial characteristics as seen in plate 17, is a deterrent to trade. If not, it reduces the available potential for the versatility of valuable land within an economically viable market centre. This creates room for planning for the market.



*Plate 17: The entrance access to the Katangi Livestock Market at 2pm on a market day. The donkey trade section at the fore
Image taken 13/04/2022*

5.2.3.4 Poor Site Specification

Katangi Livestock Market is spatially vague and lacks visual and physical definition. Devoid of animals, this desolate parcel of land is simply an idle dust pit throughout the week. It is left unoccupied and due to its open nature, promotes sheet erosion that makes the already rough patch worse. The rock out-crops are creatively used to tether the animals but other than that, they are a hindrance to movement as they are restrictive. These boulders create a bespoke spatial planning opportunity integrating nature into economic activity.



Plate 18: Katangi Livestock Market at 2pm on a market day. Image taken 13/04/2022

But as they are currently as indicated in plate 18, this is only seen as a hindrance that becomes an opportunity during the periodic livestock market which only happens for 6 hours, once per week. Separation of animals in trade is important as aforementioned. This, therefore, alludes to the importance of a clear spatial definition for safety and efficiency as opposed to the free-form nature of the market as seen in plate 18.

5.2.4 Periodic Farmers Markets

The periodic farmers market circuit along Machakos-Kitui road is an intricate network of socio-economic enterprise that comprises three major market centres which connect the vast rural hinterland to the mesh of urban areas, market centres and shopping centres throughout the south-eastern part of Kenya. The constituent markets in the periodic market circuit comprise the amalgamated markets in **Masii** township, **Wamūnyū** market and **Katangi** markets. The transport corridor connecting Machakos town to Kitui town hosts four other significant markets along it which mostly act as transitory centres. They thereby exist as a consequence of the Machakos-Kitui road, as opposed to the periodic market circuit. What sets these three major markets apart and gives them economic dominance in the region is the fact that they are assigned a weekly market day year-round, which hosts the periodic livestock market. The strategic movement of animals compels the transit of traders, consumers, and goods throughout the network and attracts, through deliberate socio-economic points of convergence, the rural hinterlands in entirety.

As a semi-arid area, Machakos County, especially Mwala sub-county, has significant reliance on animal husbandry as a major source of agricultural enterprise. Be it milk, meat, eggs, silk, leather, fleece, honey, wax, manure or service. Livestock, poultry and agro-produced invertebrates play a significant role in total agricultural production in Machakos county. The seven market centres along Machakos-Kitui road within Machakos County benefit both directly and indirectly from this. Therefore, it stands to reason that the markets directly responsible for livestock trade attract the bulk of activity and with it the developments. It is clear that livestock trade is the core to trade in the major markets within the region and it is promoted by the supporting trading activities bringing in other forms of traders to the markets as a result. With the Machakos-Kitui road as a catalyst, trade is rendered multi-nodal within a defined linear orientation. Local commerce is divergent, comprising household goods, agricultural inputs and outputs, agricultural extension services, financial services as well as human capital. These markets, on allotted market days, embody regional trade in confined spatial delineations, albeit in a temporary capacity. The successive repetition ensures the survival and gradual development of these market centres and adjoining areas as a result. Periodic farmers markets exist symbiotically in contextual settings. They allow both farmers and traders free opportunity to advertise, sell and even purchase various commodities without the restriction of space. The diversification that comes with periodic markets is akin to mobile trade as it reduces the distance of travel for residents in rural areas away from major urban nodes, they create opportunities for growth and development of the locales in which they exist and are a great proponent for territorial development. While the periodic markets require a specific day to operate, the date designation is more often than not the responsibility of local authorities. The traders are however not restricted to any markets within any given periodic circuit.



Plate 19: Image of periodic market during *market day* in Masii Market. Image taken: 11/04/2022



Plate 20: Image of periodic market during *non-market day* in Masii Market. Image taken: 12/04/2022

The purchasing power of the consumers and general population demographics play a role in the number of market days assigned to a centre as well as the spatial location of these markets. While not restricted to food trade, periodic markets tend to attract both traders and consumers, creating dynamics that bolster regional trade. That said, the difference seen in market centres during market days versus non-market days is stark. Plate 19 above shows activities in the Masii market at 10 am during a market day on Monday, while plate 20 beside it shows the same market at 10 am during a non-market day the following day, Tuesday. The difference between the two is only in the activities, as the infrastructure remains exactly the same. Table 4 below breaks down the market days for various market centres within the regional catchment. This notwithstanding, it is important to note that the markets remain open every day of the week, only that the traders and consumers are significantly reduced during non-market days.

Table 4: Designated Market Days for Periodic Farmers Markets in Various Periodic Circuits Around the Regional Catchment

<i>Day of the week</i>	<i>Designated market centre for Periodic Farmers Markets across catchment area</i>
Monday	Masii , Machakos, Kaseve, Kitui,
Tuesday	Wamūnyū , Tala
Wednesday	Katangi , Matuu
Thursday	Masii , Kitui, Ikalaasa
Friday	Machakos, Kwa Vonza, Kola, Mwala, Tala
Saturday	Tawa, Kangundo, Matuu,
Sunday	Tawa, Kangundo, Vyulya,

PERIODIC MARKETS

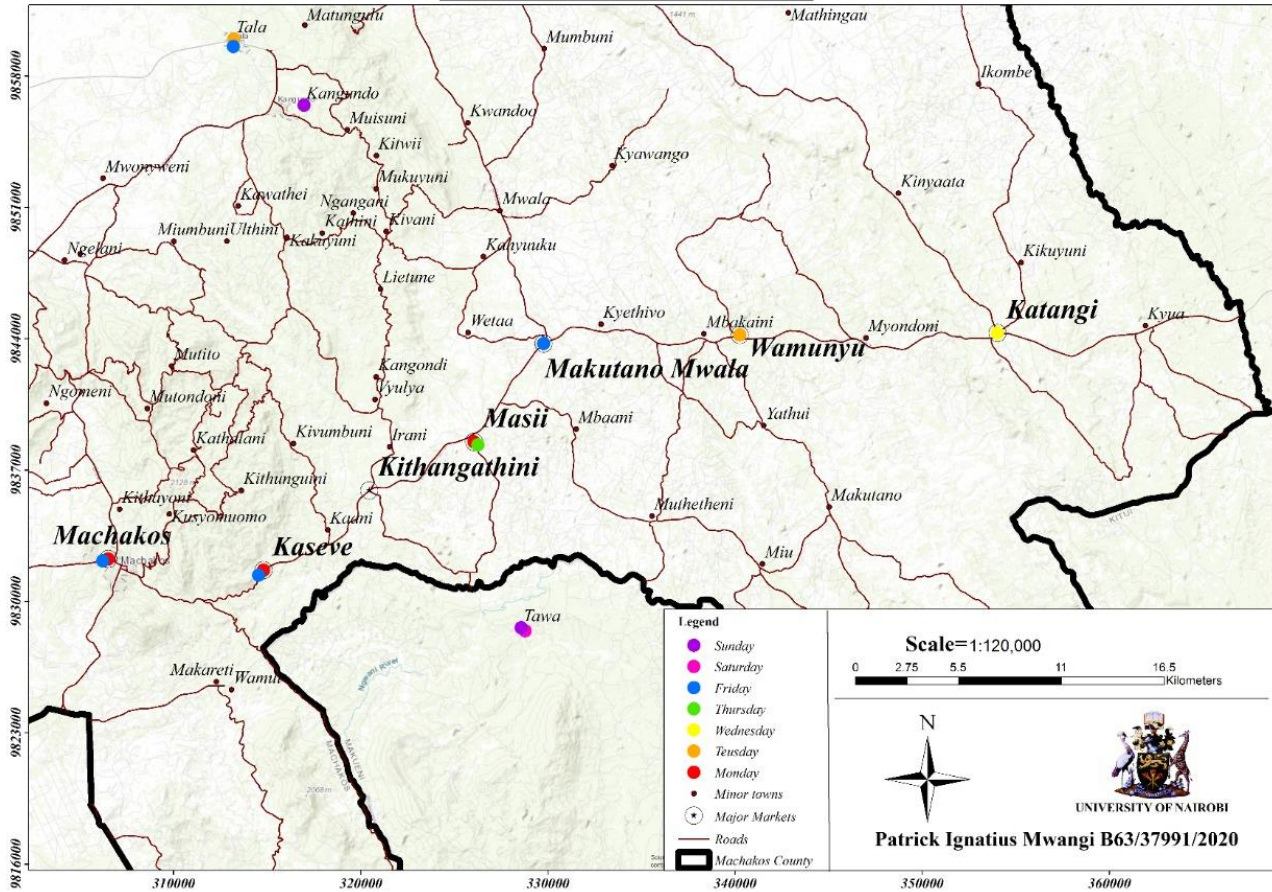


Figure 35: Periodic Farmers Markets based on operation days during the week

The various markets visited by traders who participate in the **Masii-Wamūnyū-Katangi** periodic market circuit are spatially illustrated in figure 35 above. This also illustrates the assigned number of market days per week. Figure 36 below shows the frequency of visiting these markets in order of interest by traders.



Figure 36: Markets Visited by Periodic Traders

Numerous markets usually operate throughout the week. They are widely spaced and accorded different catchment areas to avoid cannibalising each other, depending on active days. The most defined indicators of this spatial-temporal assignment are the transport routes used to access said markets. The road network is utilised as a planning element to propagate the vibrance of certain areas through accessibility. This allows farmers the freedom to decide where to establish their stations for their convenience and enables them to acquire the ideal value for their investment. This study focuses on food trade and the spill-over effects of the livestock periodic market along the Machakos-Kitui highway. Figure 37 below, shows a representation of the population average of periodic food traders in the markets during market days.

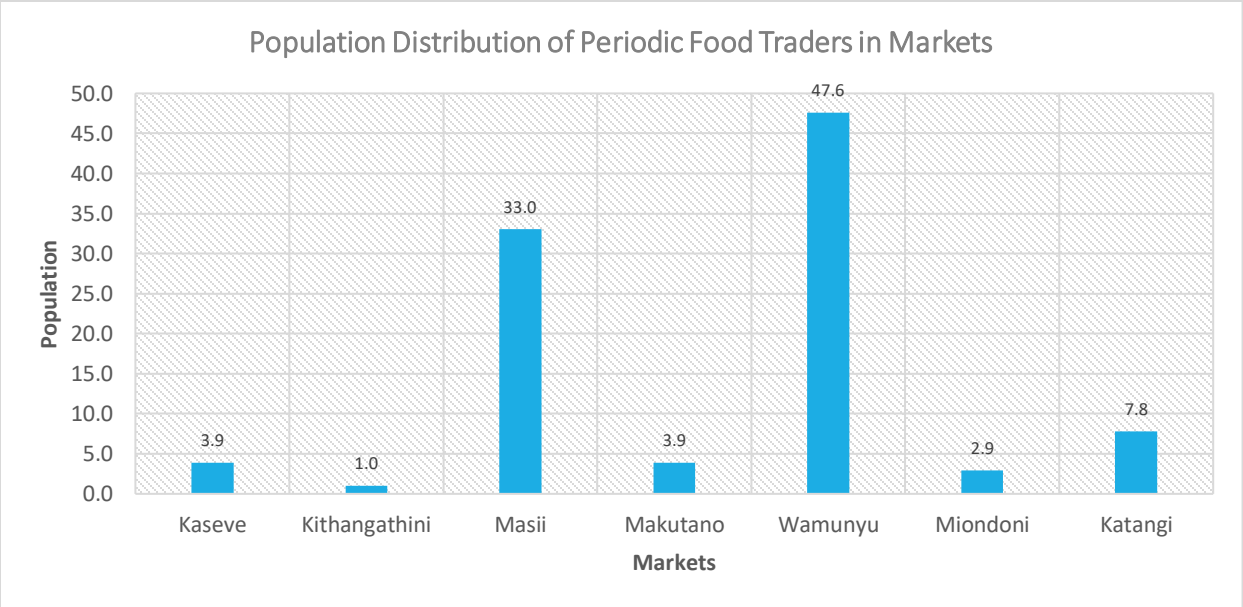


Figure 37: Population Distribution of the Periodic Market Circuit along Machakos-Kitui Road

Smaller markets within the catchment area exist as daily shopping centres for villages. They are often without designated market days as they lack the vibrancy to enhance the local socio-economic status, hence the need for connection to a larger market. This is especially important as it ensures the survival of smaller regions and villages during drought seasons. Famine often ravages rural areas in ASAL regions, and access to food, especially in the hinterlands, becomes characteristically difficult. Market days are thus vital to rural areas as they create an influx of the population in one specific area, on specific days creating an avenue for the exchange of goods, ideas, and information as well as the collective association of people. Periodicity in ASAL regions promotes compacted trade, which prompts the planning of other routine activities around designated dates. The local residents can go about their daily routines and then focus on market days for trade, social obligations and interactive conventions.

While periodic markets are valuable in the trade of both food and non-food commodities, it is important to note that not all traders participate in the periodic market circuit. Some traders operate exclusively on specific markets as resident traders year-round. The participation in farmers markets is almost an even split with 50.5% being residents in their stations in the specific markets all through. This includes farmers from the catchment area who bring in their wares to trade during the market day when its conveniently closest to them; shop owners who have occupational rights to the market, sell and store their goods within the markets as well as transit traders with bias preference to specific markets, while 49.5%

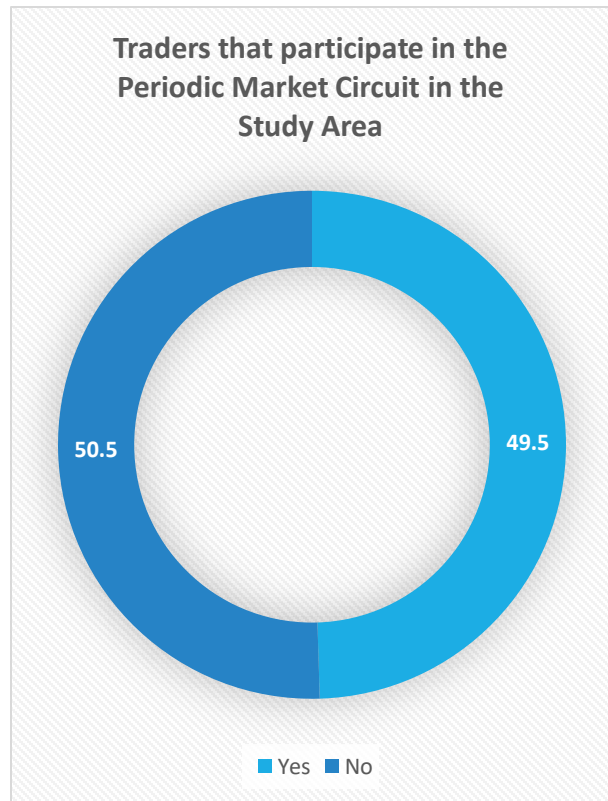


Figure 38: Traders that Participate in the Periodic Market Circuit

of the traders moving with the periodic markets.

The factors associated with moving with the periodic markets are perceived to comprise the quantity of food produce sold; the average size of the population served/ intended consumer base and their perceived purchasing power. The sale of commodities is dependent on availability from the source and this changes seasonally depending on the supply. Some market days are witnessed to carry more traders than others. The trader-consumer ratio is supply-oriented rather than demand-oriented in rural areas. This has been attributed to a need to dispose of surplus in times of plenty. This can also be due to a supply increase, the negligible value addition on agricultural produce and the lack of public knowledge on the preservation of food. Agricultural produce floods the markets, significantly lowering the demand, and negatively affecting the price of commodities. With a majority of the food consumed being fairly perishable and the idea of ‘freshness’ being the hallmark of farm produce, it is difficult to control the influx of agricultural produce. Storage is a challenge as some commodities have a relatively short shelf-life. When produce is bountiful, especially during the rainy season and subsequent harvest season, the food markets experience a 17.5% increase in the number of traders. This is due to the increase in the number of farmers participating in the sale of food. This is not to disparage the importance of farmers to ‘Farmers Markets’, but rather, it is a reveille to the limitations of poor planning on rural economics around food distribution and the impact this has on the catchment areas and rural hinterlands.

Each periodic market bears unique qualities and intrinsic characteristics which define its niche. It is not uncommon that some markets benefit from preferential treatment above others. Of the three centres, *Masii* carries the largest economic weight. This is due to its location at an intersection that convenes Machakos town, Kitui town and Wote town, the county headquarters of their respective counties. These three counties have over the years benefited from the central location of *Masii* township. And as a result, **land-value capture**¹⁴ is a looming conversation for the residents of the town, whose amplified benefit from public investment disproportionately accords advantage to the township and her inhabitants above and beyond any other town of that size and status. This has historically promoted the organic growth of *Masii* township, elevating it above her neighbouring market centres. This has seen growth in the markets within *Masii* as well as differentiation of economic significance with the creation of a livestock market, a food market and a clothes market.

That notwithstanding, food trade as a major component of trade within rural towns is not determined by the size of the town, but rather by the consumer base it serves. As such, due to its size, *Masii* township has allowed for the growth of smaller satellite market centres around her and has over time seen a decline in direct food dependence. Albeit a positive indicator, it highlights the importance of the hierarchy of markets. Nonetheless, while food traders tend to prefer trading in **Wamũnyũ** market, *Masii* market is the only rural market in the region with two successful market days in a week, on Mondays and Thursdays. In addition to a larger pedestrian traffic expected, more market days and vehicular connectivity, prices played a significant role in preference for trade. As shown in figure 39 above, 52% of traders preferred various markets on the periodic circuit based on personal and economic reasons. Only 5% of traders remained neutral. 46% of traders pointed out that participation in the periodic markets circuit was a product of circumstances, indicating that their low frequency in the periodic market did not warrant specific preference, but rather, their current needs and the markets closest to them at the time.

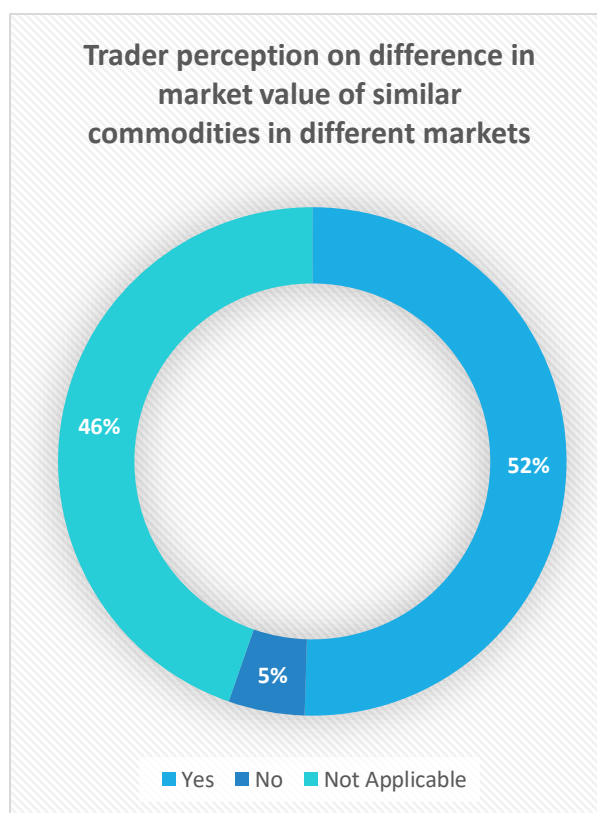


Figure 39: Trader Participants in The Periodic Market Circuit

¹⁴ **Land value capture** – is a policy approach which enables communities to recover and reinvest land value increases that result from public investment and government actions. This is rooted in the notion that public action should benefit public benefit. www.oecd.org

Some of the issues raised that result in preference of specific food markets over others included the spatial allocation for the open-air market system; better prices for commodities; high and/ or unfair competition from other traders; pedestrian traffic within market centres; purchasing power of local consumers; and proximity/ accessibility to other markets. as seen in figure 40, **Wamūnyū** market was the most popular, at 39%, **Masii** was second, at 37%, with **Katangi** trailing at 7%. The remaining 18% consists of resident traders within the periodic farmers markets who did not participate in the periodic market but rather traded regularly, some even daily, within their own local market. This creates a situation where periodic markets become de facto ‘Farmers Markets’ hence the name ‘*Periodic Farmers Markets*’. These farmer-traders account for 42% of all traders who participate in the periodic markets

Unique circumstances created by periodic markets allow for the direct involvement of producers in the trade of home-grown commodities. This has seen the growth of agronomics, especially around areas with proximity to food markets. Subsequently, the ongoing drought has created concerns about unsustainable food systems and the resultant dire situation created by the fickle food supply chains as seen due to the COVID-19 pandemic. Poor planning for rural-urban linkages

and the lack of planning for food systems in Kenya leaves the local populations at the mercy of the traders and policy-makers. And in the event of a supply-chain breakdown, this would have dangerous far-reaching consequences. Therefore, the transport system is seen to make it more convenient to transport produce to markets closest to farmers during the periodic market. As a result, 82% of traders sell locally produced food when available, as shown in figure 41 above. This accounts for food produced by local farmers, food from their own farms, as illustrated in figure 42, as well as food that is produced close to

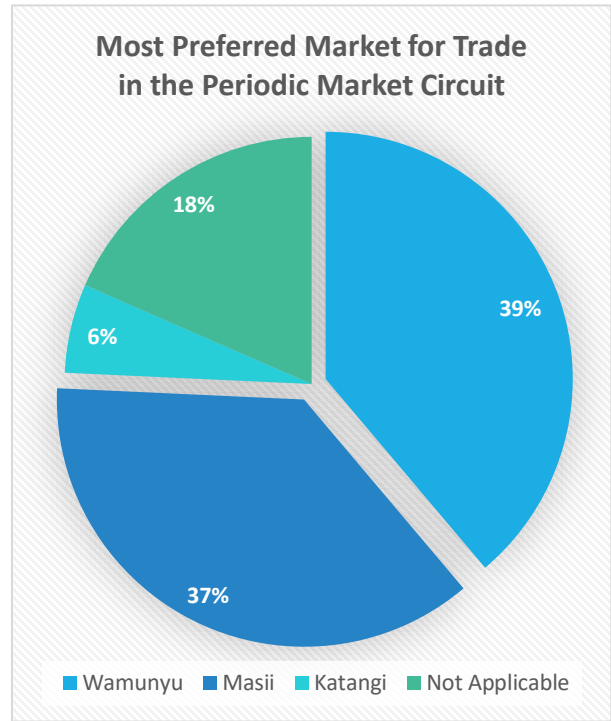


Figure 40: Market Preference by Traders in Periodic Market

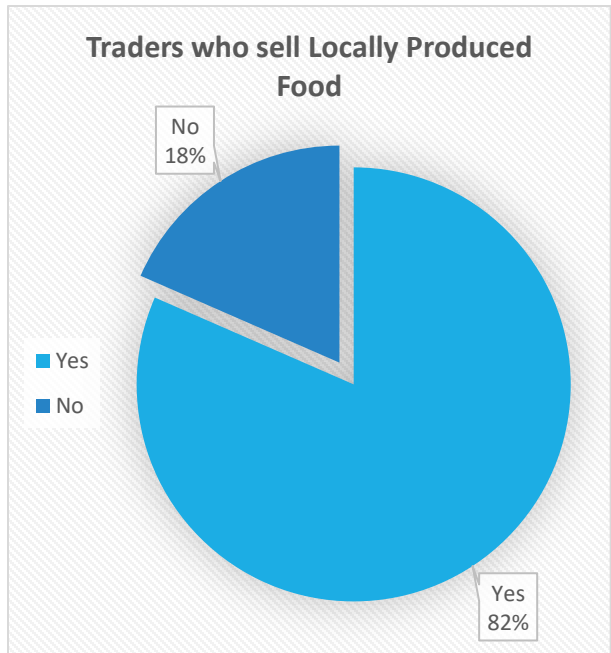


Figure 41: Traders who sell locally produced food

And in the event of a supply-chain breakdown, this would have dangerous far-reaching consequences. Therefore, the transport system is seen to make it more convenient to transport produce to markets closest to farmers during the periodic market. As a result, 82% of traders sell locally produced food when available, as shown in figure 41 above. This accounts for food produced by local farmers, food from their own farms, as illustrated in figure 42, as well as food that is produced close to

the market centres. These traders often utilise the open-market system that is regulated by the local authorities, sprawling along the pedestrian-laden transport corridor within and around the markets, which is only allowed during market days. Plate 21 shows a trader in an open-air station, with produce that is sourced from markets outside the catchment area. This open-air system is preferred by traders due to a broader display area of commodities. This however neglects health and safety compromising public health. Open-air markets are a symptom of the inability of a local authority to provide infrastructure



Figure 42: Traders who Market Home-grown Produce



Plate 21: Traders in Wamünyü market operating in open-air stations with food arranged on canvas along the road around the market square. Image taken: 12/04/2022

for trade in markets and should be addressed as the systemic problem it is. Plate 22 shows a trader-farmer selling produce from a temporary station along the road on the periphery of the livestock market in **Wamūnyū** market centre, put up specifically for trade during a market day. Such horticulturalists come from the direct vicinity of the market area, where they endeavour in irrigation farming using water from River Athi. These farmers tend to rely on water from the river due to the semi-arid nature of the area and the low precipitation levels experienced. The availability of an outlet for their produce motivates local food production, albeit in small quantities, which helps address food dependency on other regions. While the levels of production are considerably limited, it is important to note that this is a step in the right direction, as with technology evolution, public participation and knowledge of agricultural skills for optimal production, it becomes increasingly more efficient to advocate for local food production. The varieties of food grown, in comparison to the total food sold in the periodic markets, are relatively limited. The select few include maize harvested as green corn, horticultural produce in form of fruits and vegetables as well as drought-resistant tubers.



Plate 22: A small-scale tomato and green-vegetable farmer operating a temporary open-air station during the Wamūnyū market day along the road around the market square, at the northern periphery of the open Wamūnyū Livestock market. Image taken: 12/04/2022

Yet, due to proximity to the periodic markets and perishability of fresh produce, traders participate and promote the sale of locally produced food. 82% of traders carry a portion of locally produced food commodities. The production indicated is within the context of the specific markets in question with only 18% of traders deal in produce from outside the catchment area. These traders specifically deal in food commodities that can neither be grown within the rural hinterlands of the semi-arid climate nor food whose production dynamics significantly disadvantage small-holder farmers within the local context. This is especially in the case of *bulbs and rhizomes* as shown on plate 23 with high water needs. The



Plate 23: Bulbs and rhizomes sold in periodic markets acquired from Nairobi Mũthurwa market outside the Rural catchment area. Image taken: 12/04/2022

movement of goods and services into the periodic market circuit from various parts of Kenya, as shown in figure 43, and the East African region at large, is positively enabled by efficient transport networks. The road networks allow for ease of county-to-county access, a factor that has promoted food availability with the potential to reduce the risks of the food desert phenomenon for both rural and urban areas, even in the wake of unreliable rainfall and failing local food production capacity from rain-fed agriculture.



Figure 43: In-flow of food, livestock and agricultural produce into Machakos County from all over Kenya

5.2.4.1 Periodic Markets and Regional Economics

With regard to food and livestock trade, the peak market days were Mondays and Tuesdays for Masii and Wamũnyũ markets consecutively. This is due to the belief that the bulk produce was still relatively fresh; that these market centres had a higher purchasing power; that the markets had a significant influence on their direct rural hinterland and that the consumers were considerably more. The traders, as in figure 44 below, showed a similar preference for Masii and Wamũnyũ periodic markets on Mondays and Tuesdays at an average of 23.9%. While the Masii market is spatially larger, it is considered to be relatively more expensive. This impacts the consumer base. For products that have a longer shelf life, such as bulbs and rhizomes; cabbages and some fruits; traders find that the high supply in Masii impacts the sale of commodities, making it harder to compete; while at the same time that Wamũnyũ, while smaller, avails more opportunity for commodities brought in from other counties.

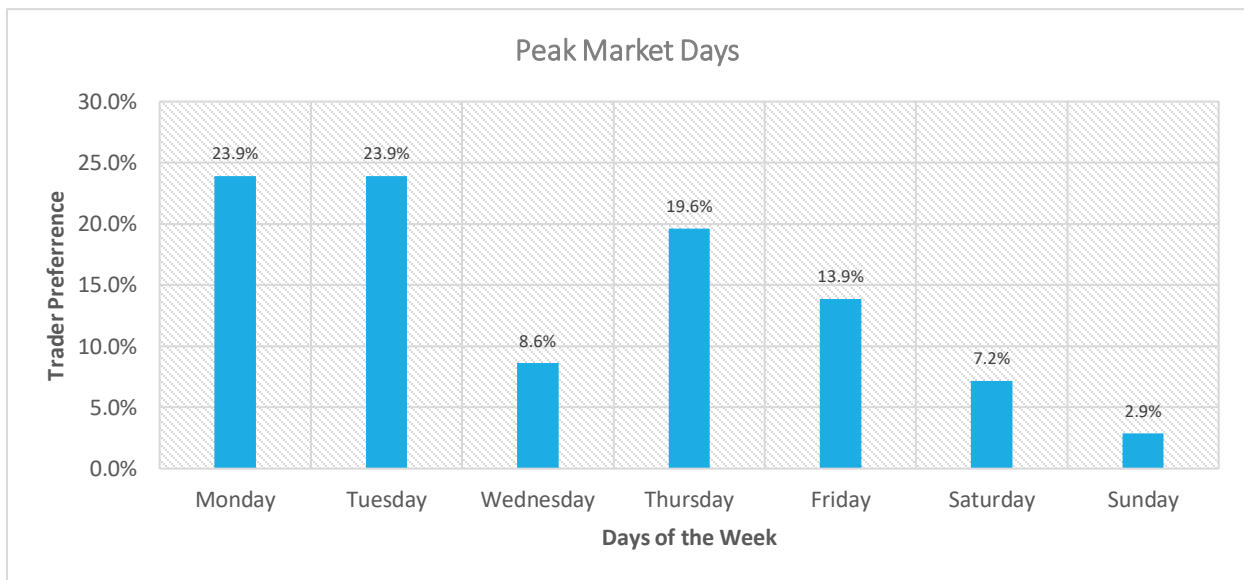


Figure 44: Peak Market Days in The Periodic Markets

The flow of people in a market centre is directly dependent on available modes and means of transport. In the case of Machakos County, the dominant mode of transport is land transport, featuring road and rail. For the purpose of this study area, the catchment area, as well as the connecting transport mode, happens to be a road, the status of which is different based on the locale. The means of transport utilised in the study area include *Matatu* (33-seater or 52-seater PSV mini-buses), *Nissan Caravan* (14-seater PSV), *boda-boda* (bicycle or motorcycle taxi), *tuk-tuk* (Auto rickshaw), *Maruti* (7-seater Suzuki Maruti Omni) and animal-powered transport. Of the aforementioned, the most commonly used, and populous means of transport is the *boda-boda* - bicycle or motorcycle taxi. These have gained traction over the years due to the flexibility of bicycles and more recently, motorcycles in traversing unfavourable terrain and underdeveloped back-roads.

According to the National Transport and Safety Authority (NTSA), there was an estimate of over 1.39 million active motorcycle operators in Kenya in the year 2018. This was accompanied by an estimate of 17,000 new registration of operators per month, and that 99% of all the motorcycles registered were used for commercial purposes. On 28th March 2022, the State Department of Devolution launched a campaign for the registration of boda-boda motorists at 28no. Huduma Centres nationally. This was done with an initial target of 2.5million boda-boda operators, as was the estimate given by the State Department of Devolution Principal Secretary at the time of the address. The numbers translate to a proportionally

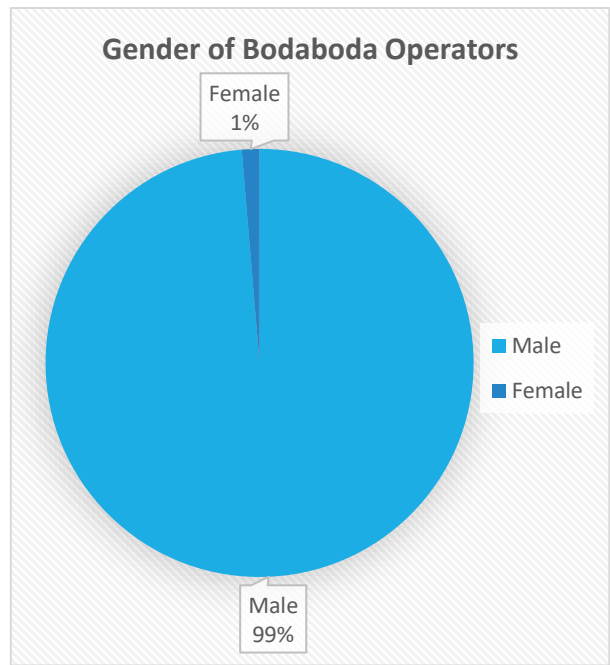


Figure 45: Gender of Boda-Boda Operators in Periodic Market and Regional Catchment

large population of motorists in Machakos County, which is a reflection of the popularity of the transport means. While the road network in Machakos County is considered to be developing, upgrading of access roads into the rural hinterland is yet to be actualised. The low populations render other public means economically unsustainable, creating a niche for *boda-boda* (motorcycle taxis) operators in the study area.

For the purpose of transport analysis in this study, motorcyclists were involved in the rationalisation of transport routes, as their native knowledge of the contextual socio-economic neural network is bespoke to their unique position as navigators, traders and porters. They comprise a unique occupational definition that has been a bone of contention due to the push-and-pull factors accompanying their involvement in transport. This has seen the revolutionization of transport all over Kenya. Their capacity to ferry people, and goods and service delivery makes them uniquely qualified for their roles as individual components of the larger transport spectrum while also being avid contributors to the local circulation of currency, connectivity and territorial integration. Rural integration is considered to be more developed currently as a result of enhanced connectivity. Motorcycles bear a brand of utility as they are also considered assets for rural socio-economic indices. While small, they are a potential means for output distribution, sales and marketing. They offer affordable accessibility and constitute a large proportion of rural navigation, especially in places devoid of alternative means of transport.

Within the study area and adjacent regional catchment area, the general population of *boda-boda* operators is hegemonically male. As shown in figure 45, approximately 98.7% of the operators identify as male. The 1.3% of female operators, is however found solely around the Katangi area. The reasons cited

for these differences were: risks to physical security, probable harassment and perceived need for physical strength, especially when traversing areas that required intricate navigation and for transportation of goods which required heavy lifting. However, these reasons were provided by the male part of the spectrum necessitating a more in-depth analysis of equality in gender roles as an independent study on equity in service provision by female operators.

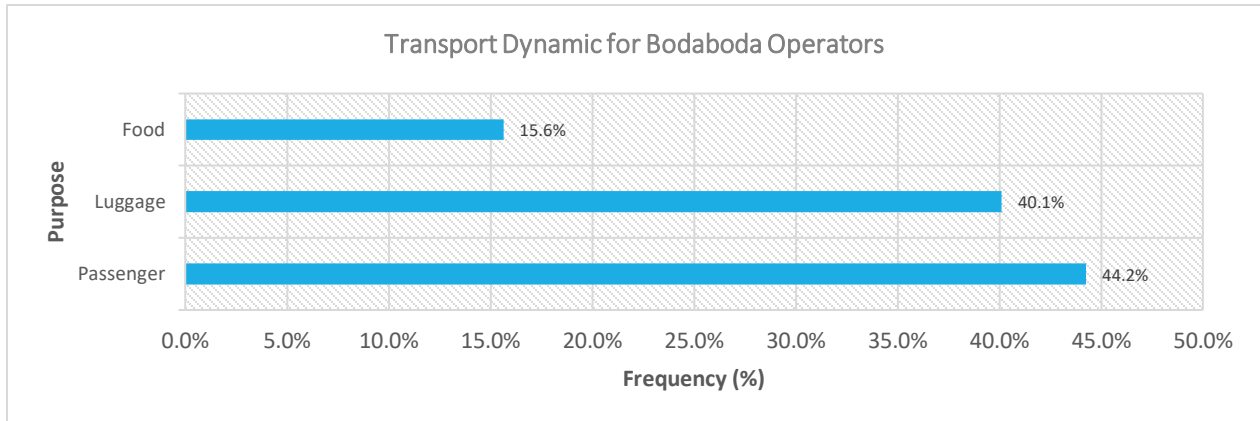


Figure 46: Transportation Dynamics in Periodic Market Circuit and Regional Context

The *boda-boda* operators are used in various aspects of rural life. Of note is that transportation by *boda-boda* is done for passengers and various commodities, ranging from construction material, to food, water, small and medium-sized livestock, to living plants. Modifications are made on carriers to accommodate the bespoke economic purpose intended. These carriers can either have a crate, sitting pad, grill, a safe-box or a refrigerated box, depending on the needs of the operator. For the study area, three elements were considered: passengers, general goods and food. The respondents indicated that they transported general goods 44.2% of the time as shown in figure 46. This also included instance of food transportation in cases where packages were undisclosed; transportation of small mammals such as goats and sheep, poultry; animal products; tree seedlings, etc. 15.6% frequency was recorded for the conscious transportation of food. In this case, the motorists had access and communication with farmers, farmer-traders and traders. Herein, motorists made special provisions for the transportation of goods, and from it, allowing for the efficient and safe transportation of food. This included the food collected from farms to the point of sale; from points of purchase to personal residences; from point of sale to storage; from storage to point of sale and from residence to residence. This included: fresh produce; agricultural input and implements; processed agricultural produce; ready-to-eat food as well as animal feed. The bulk of the activity was highest recorded with the movement of people from place to place, accounting for 44.2% of the total.

The business environment in markets is different for various groups of people participating in the periodic farmers markets. Experiences are based on factors both visible and invisible. For instance, during market

days, the population of people increases drastically. This may be perceived as good to some as simple arithmetic denotes that an increase in people means an increase in sales. However, for the transport sector, other factors come into play. For example, in traffic routes with motorable roads, an increase in the number of people increases the economic potential for transportation which attract Public Service Vehicle (PSV) mobilisation. The cost of transportation via PSV is significantly lower than on motorcycle taxis, as such the passengers are more inclined to board PSV as opposed to the boda-boda. In this case, the returns on market days for boda-boda operators on said routes, significantly diminish. This, as shown in figure 47, was recorded at 20%, where operators indicated that market days reduced their customer base.

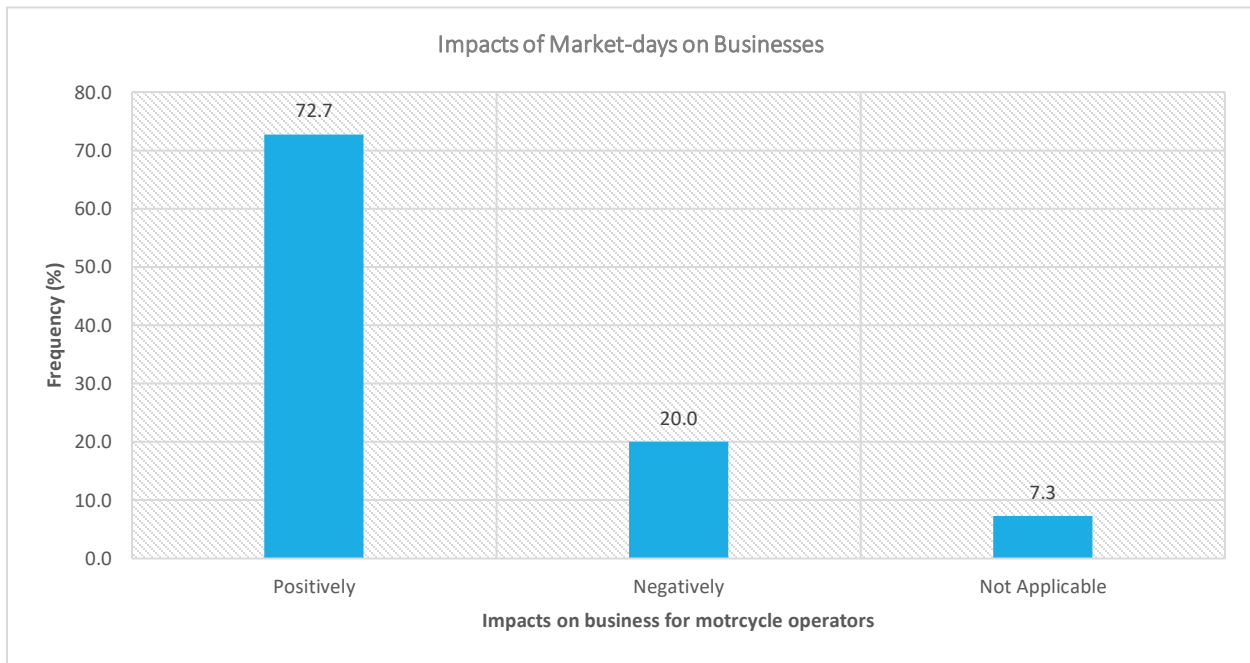


Figure 47: Number of Trips Made by Boda-Boda Operators During Market-Days

In other cases, the increase in population meant that the participants of the periodic farmers markets had the potential for more carriage capacity, meaning that they would require assistance to their doorsteps, as opposed to using PSV, which only stops at designated termini of operation. This resulted in an increase in business for participants of this nature. Such cases accounted for 72.7% of the population, citing an increase in sales, due to the increase in population. Some areas, however, had minimal alteration as far as business fluctuation was concerned. These included routes which constituted both PSV and motorcycle trade routes. The balance of the two seemed to maintain the status quo, as the operators retained their business base due to the PSV taking in the surplus. Some operators however indicated that market days had a negligible impact on the passenger flow, at an average of 7.3%.

Figure 48 below accounts for the estimated number of trips made by boda-boda operators during market days and the frequencies recorded. The least accounted for no trips during market days, while the highest number of trips recorded was forty a day for market days. Areas requiring shorter transit accounted for higher trips while the areas that took longer trips accounted for a lower number of trips and relatively lower turnover.

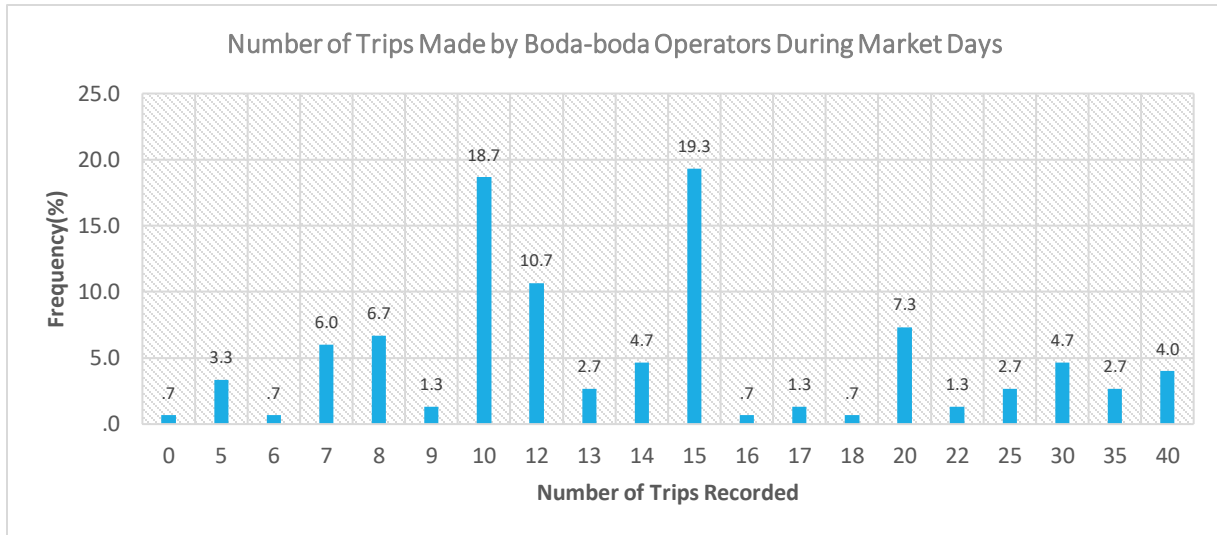


Figure 48: Impacts of periodic market-days on business environment for boda-boda operators

The situation during non-market days translated to a relative reduction in the number of trips made by operators. The highest, as shown in figure 49, recorded twenty-seven trips a day, with the lowest at only two trips per day during non-market days. The impact of the seasonal fluctuation of traffic is directly indicative of the movement of people from place to place. This is relevant in the study as it helps assess the movement of people, goods and money. The economic impact is a significant component of trade as it defines the furthest stretches attained by regional development.

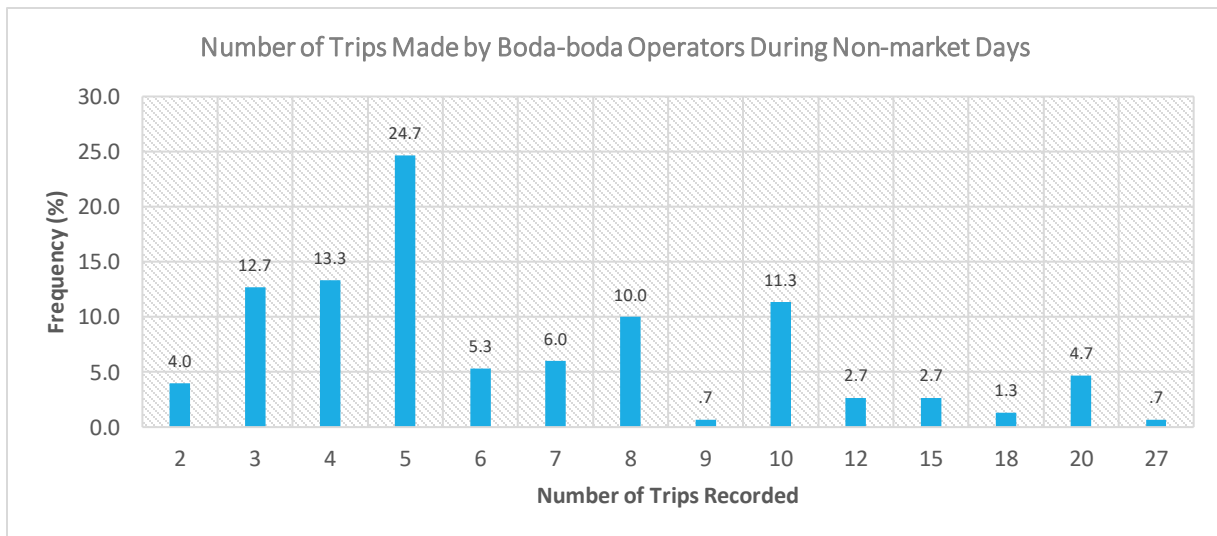


Figure 49: Number of Trips Made by Boda-Boda Operators During Non-Market-Days

5.2.4.2 Transportation Routes Associated with Masii Township

These comprised routes along Machakos-Kitui road, from the market centre into the hinterlands and from market to market. Figure 50 gives percentages of operators per route operating from Masii township.

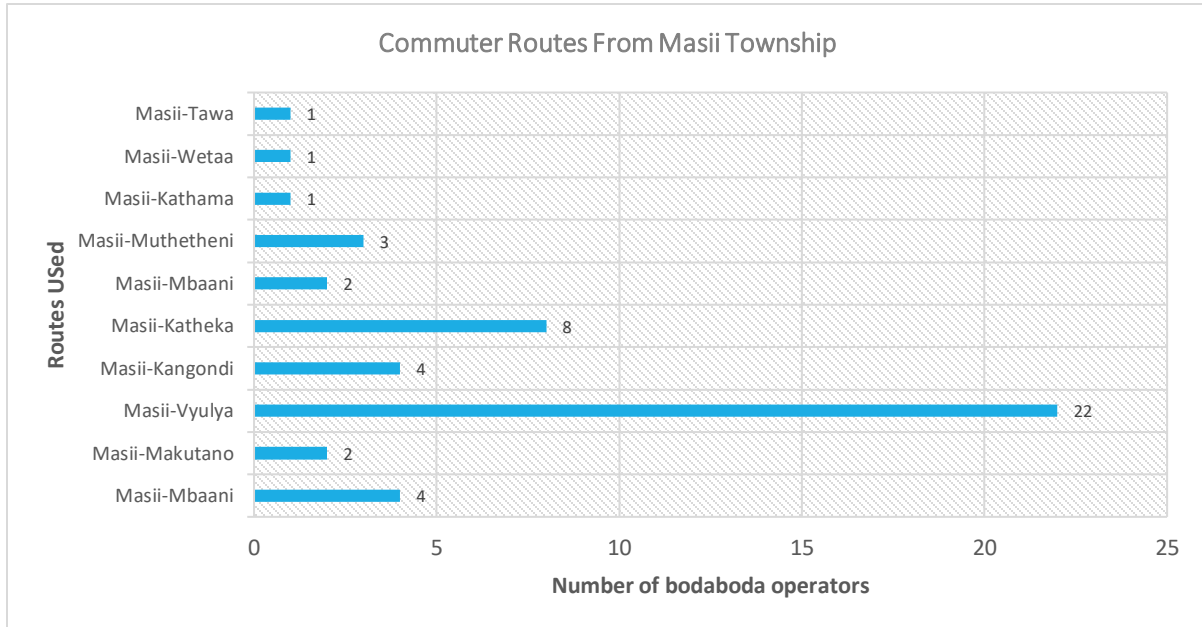


Figure 50: Commuter Routes from Masii Township

5.2.4.3 Transportation Routes Associated with Wamũnyũ Market Centre

These consisted of routes along the Machakos-Kitui highway, from the market centre into the hinterlands and from market to market. Figure 51 below illustrates the percentage of operators per route operating from Wamũnyũ township.

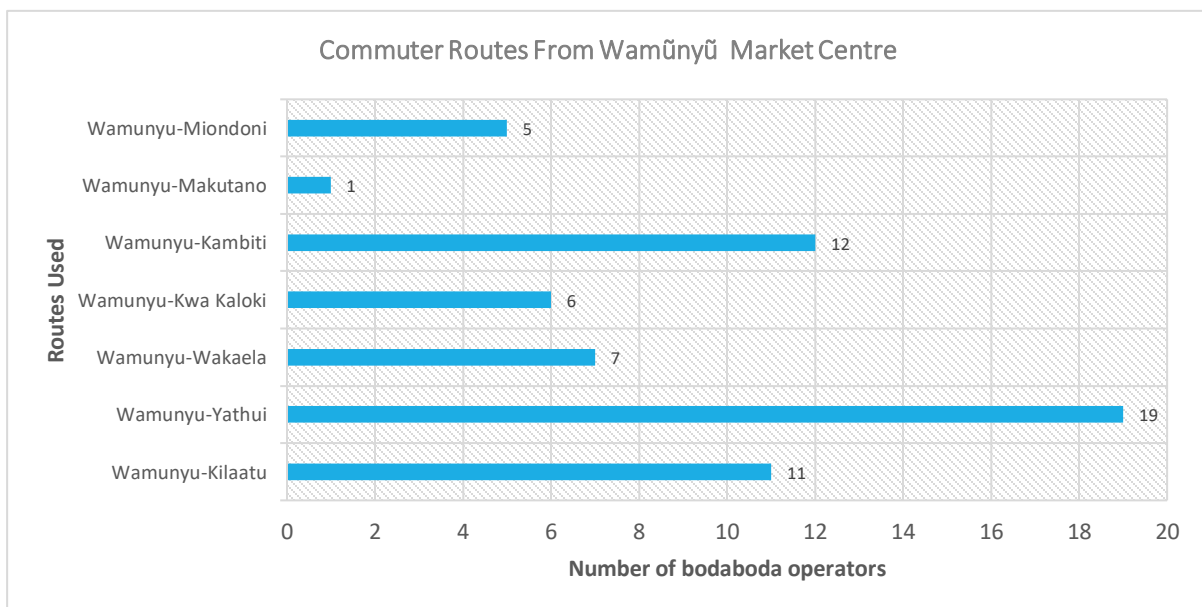


Figure 51: Commuter Routes from Wamũnyũ Market Centre

5.2.4.4 Transportation Routes Associated with Katangi Market Centre

These included routes along Machakos-Kitui road, from the market centre into the hinterlands and from market to market. Figure 52 gives percentages of operators per route operating from Katangi Market centre.

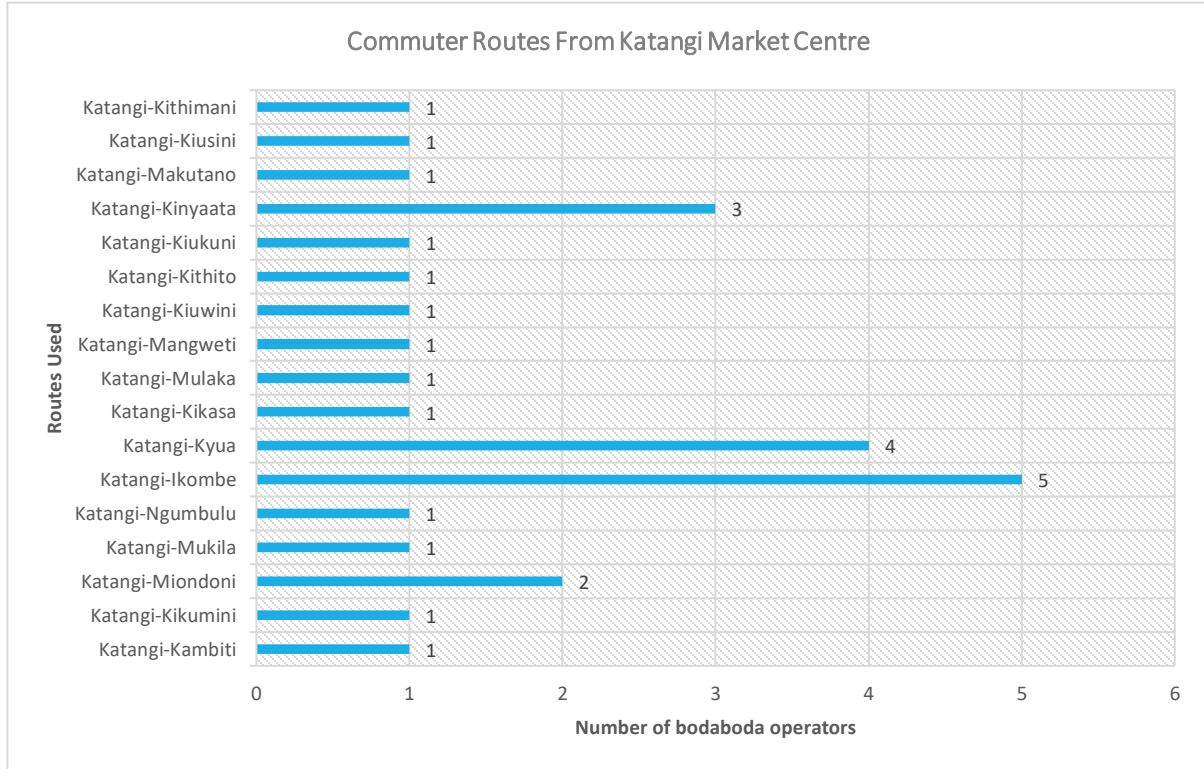


Figure 52: Commuter Routes from Katangi Market Centre

5.2.4.5 Transportation Routes Associated with Kithangathini Shopping Centre

These included routes along Machakos-Kitui road, from the shopping centre into the hinterlands and from market to market. Figure 53 gives percentages of operators operating from the Kithangathini Shopping Centre.

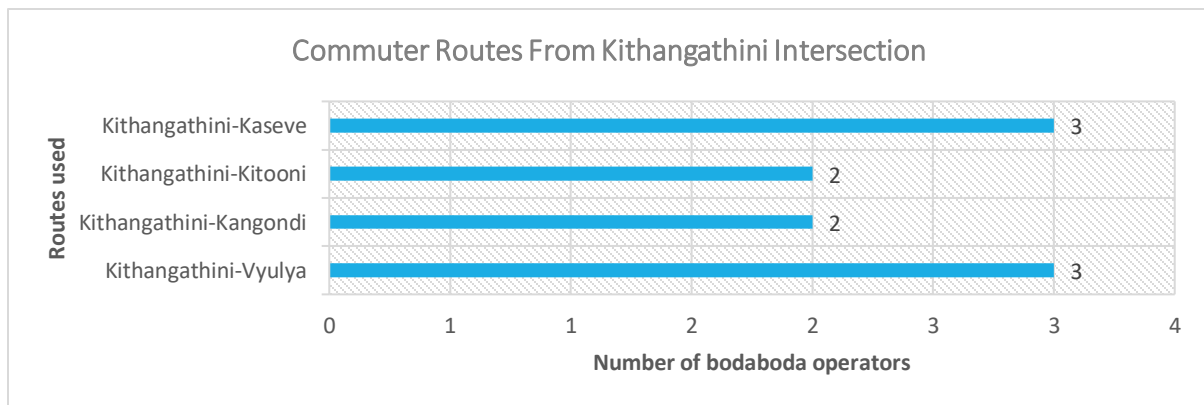


Figure 53: Commuter Routes from Katangi Market Centre

5.2.4.6 Transportation Routes Associated with Miondoni Shopping Centre

These comprised routes along the Machakos-Kitui highways, from the shopping centre into the hinterlands and from market to market. Figure 54 gives percentages of operators operating from the Miondoni Shopping Centre.

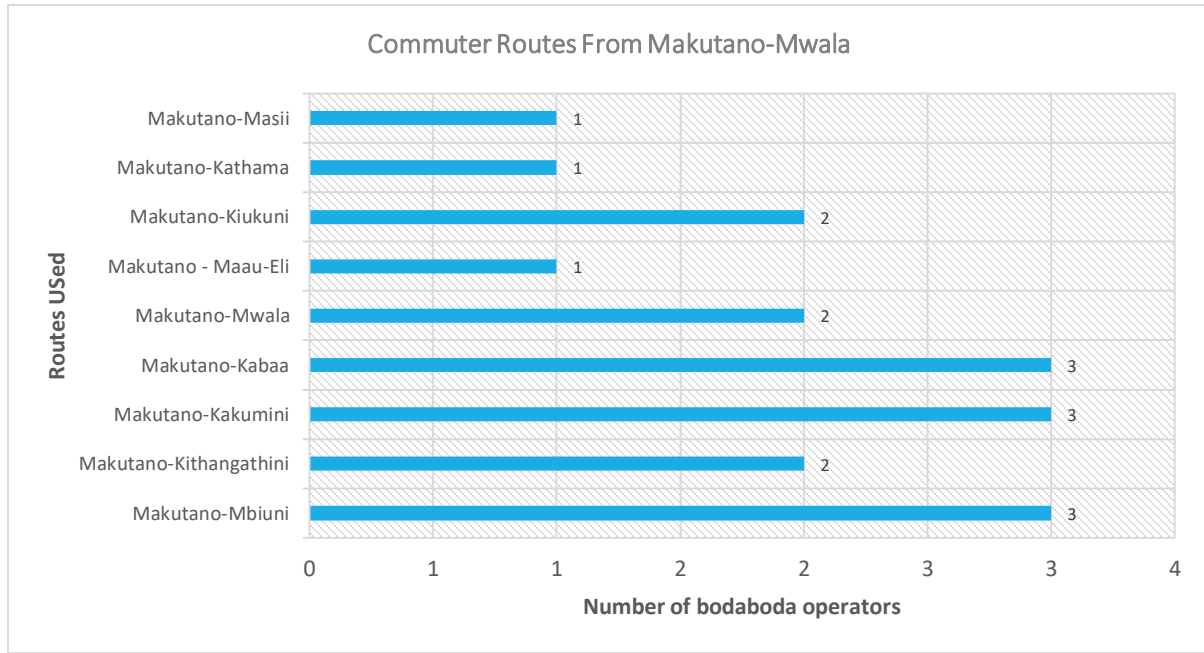


Figure 54: Commuter routes from Mwala Intersection

5.2.4.7 Transportation Routes Associated with Makutano-Mwala Intersection

These included routes along Machakos-Kitui road, Mwala-Masii road, from the shopping centre into the hinterlands and from market to market. Figure 55 gives percentages of operators operating from the Makutano-Mwala intersection.

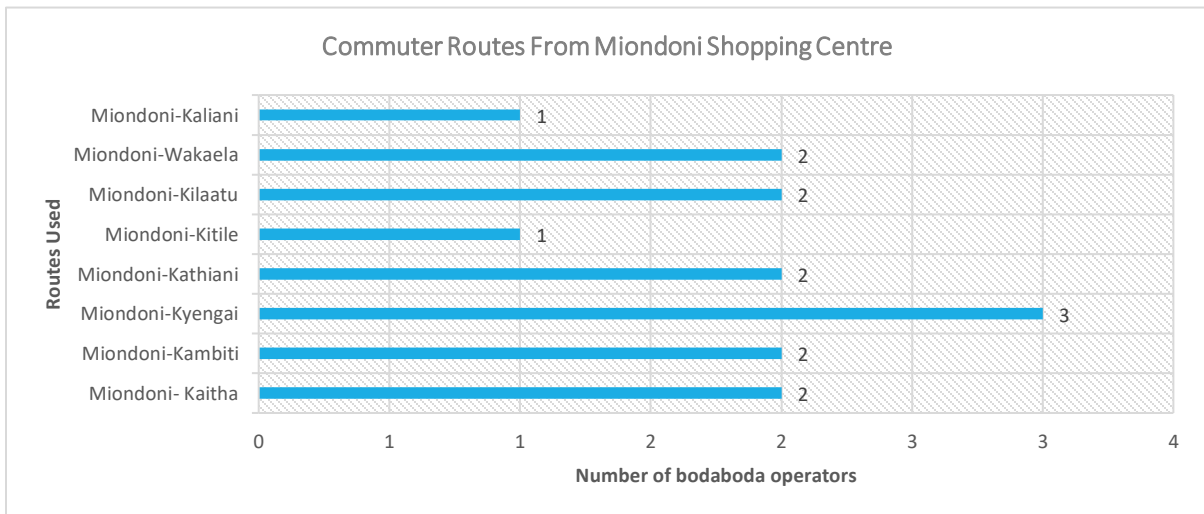


Figure 55: Commuter routes from Miondoni Shopping Centre

The larger the population of operators on a route, the more human traffic and more often than not, the higher the returns. However, the assignment of routes is predominantly dependent on the origin of the operators. Upon assignment, a boda-boda operator is expected to utilise the route of designation. This is further enhanced by a coding system generated as a local arrangement for the operators where they set their own rules and by-laws to protect themselves and each other.

5.2.5 Security and Periodic Farmers Markets

The boda-boda operators are used for as long a distance as 40km. This can be testy in the event of unfamiliarity as the risks along the roads can be considered to be unpredictable. Along the various routes, several security issues were highlighted. For instance, the operators indicated that some of the customers they got failed to pay them, which resulted in heated exchanges, and sometimes physical exchanges, especially for routes on long distances. This resulted in economic loss for the operators. Physical danger in form of theft, armed theft and assault on the operator were also common occurrences. Motorists also indicated that there were significant altercations, especially in areas with minimal security surveillance by the police. There were cases of kidnappings and motorcycle theft indicated, with minimal recovery rates. As a precaution, the operators chose to maintain a status quo by only operating in a selected area. This directly contributed to the operators categorically declining to ventures outside their known routes of operation. Other security issues cited by the motorists include attacks from wildlife, such as hyenas and hippopotami as well as migrating bee swarms. There was mention of the dangers experienced when crossing drifts, especially during rainy seasons. This is reported to have cost numerous lives of operators in the region. All considered native knowledge of the routes rendered 48.6% as being positively valued on the transport routes as seen in figure 56 below.

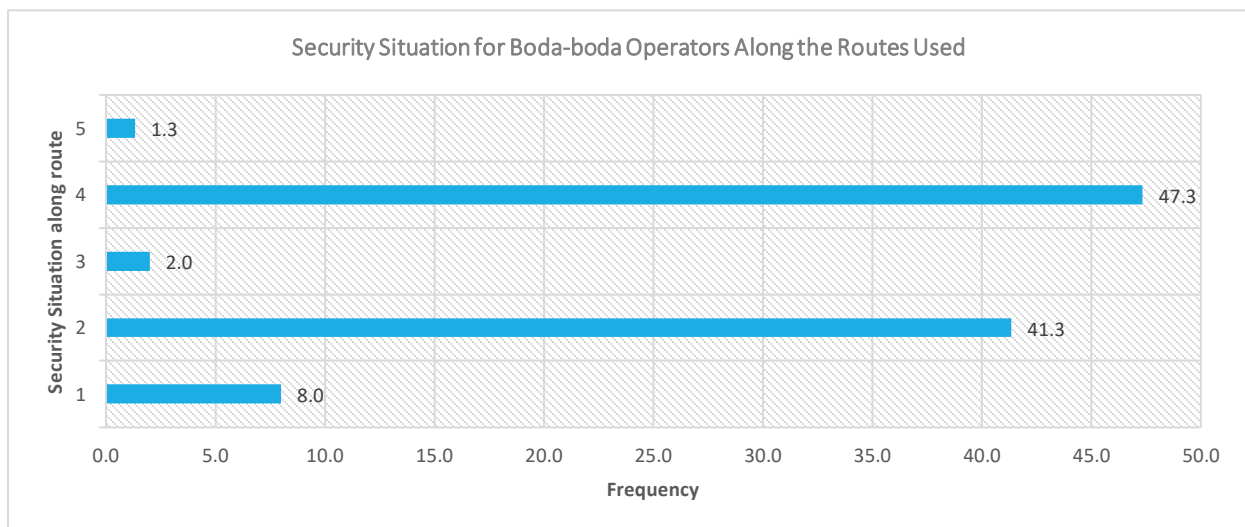


Figure 56: Security Situation for Boda-boda Operators Along the Routes Used

The security situation is however based entirely on the perception of the operators. They indicated that more need is done to accommodate the roads. This was due to the poor status of some access roads. The motorable roads were all-weather roads, which in some localities, due to clay soil types, became dangerous skid-prone and incredibly dangerous. Approximately 61.3% of the respondents as seen in figure 57, were positively inclined toward the situation within the market centres. The operators however indicated that the security situation in the markets required review. This was especially in regard to street furniture, marked exits, patrols by security forces and electricity/ solar connection to allow for security lighting. These shortages resulted in the constraining of activity after sunset, meaning that activity within the market is terminated before nightfall. This was considered a financial disadvantage as longer working hours for the markets would allow for longer hours for the exchange of currency in the markets centre.

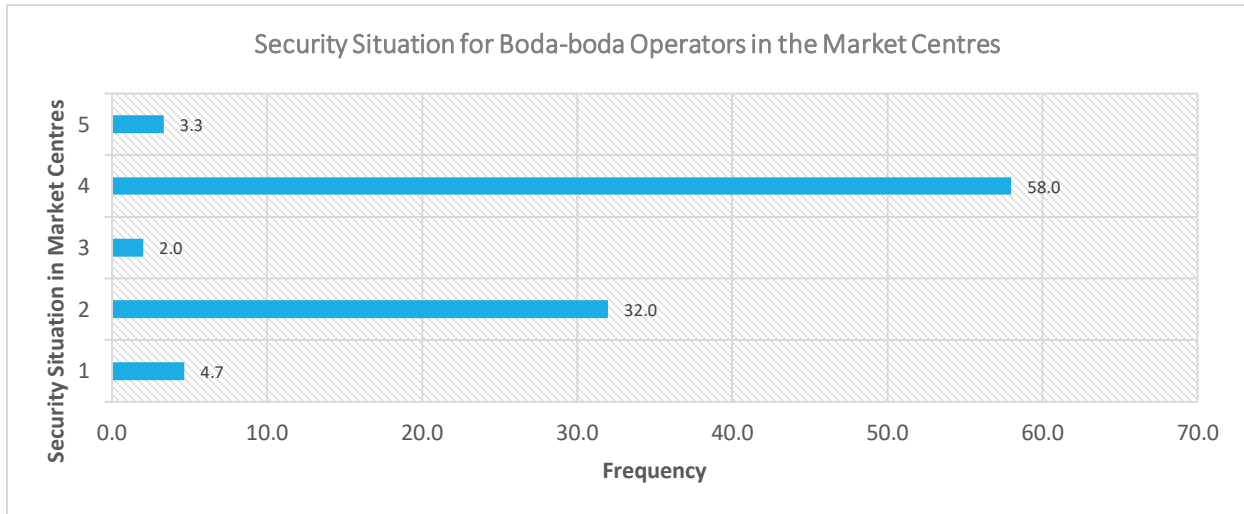


Figure 57: Security Situation for Boda-boda Operators Along the Routes Used

5.3 Findings of Objective 3: Periodic Farmers Markets Interventions for Resilient Rural-Urban Linkages in a Post-Pandemic Era

Consumer analysis based on trader perception is responsible for the business models adopted in periodic farmers markets. That said, traders orient their goods and services based on the intended consumer as in the case of all free markets. It is a matter of supply and demand. In food markets, they heavily rely on existing market situations to regulate: the amount of produce to avail for trade; the prices of commodities; which markets to take what goods and in extreme situations, whether or not to attend a market at all.

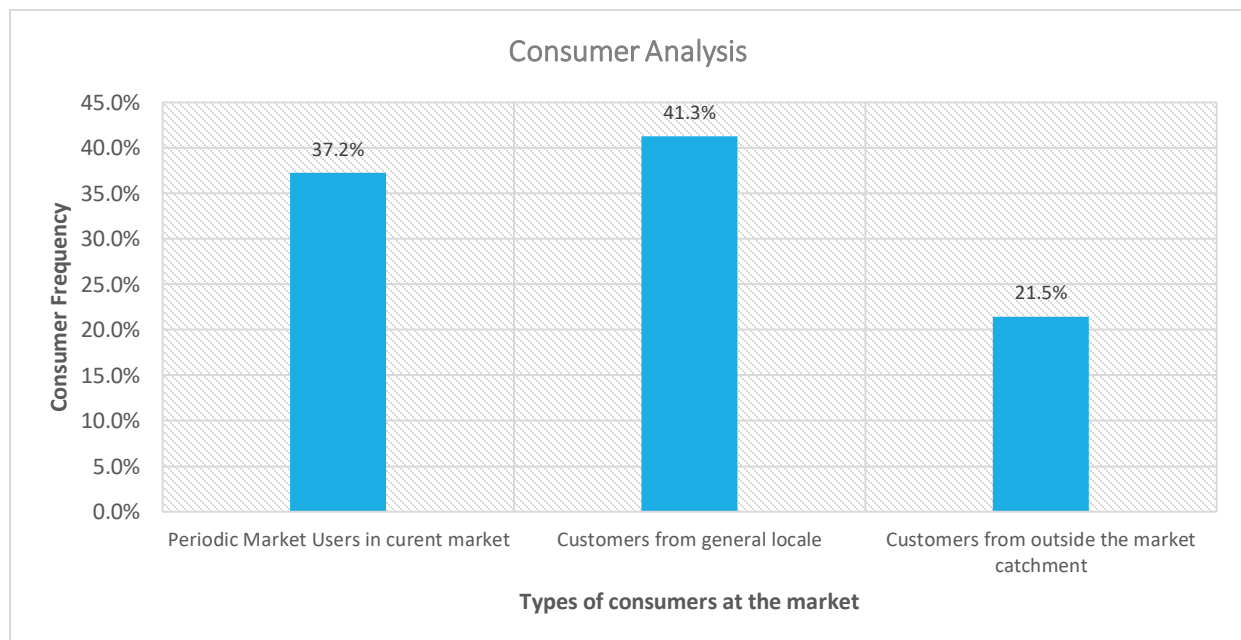


Figure 58: Consumers at Masii-Wamũnyũ-Katangi Periodic farmers markets circuit

As illustrated in figure 58, consumers originate in: the locality and direct vicinity of specific markets; the catchment area of the periodic market circuit and regional hinterlands; as well as regions away from the local catchment area which may refer to customers from all over Kenya. As shown in figure 58 above, 41.3% of the expected consumers generally originate in the market's regional context. It is worth noting that by the essence of the markets 'moving', people are more susceptible to participating in the market as traders, farmer-traders and as consumers with the unique advantage of proximity and pre-determined time. The markets attract people from different walks of life and offer the opportunity for diversity. The periodic markets attract larger volumes of users as opposed to regular market days. This is done due to the low population densities of the areas concerned; the similarity in agricultural produce; the potential for diversity of goods and services; the need for external revenue as well as to motivate the circulation of currency. This sustains local economies and creates grounds for strategic regional development using the market nodes as point references for the fact.

Producers, on the other hand, gauge the value of their output based on the reception rendered by the consumers. This has historically been the driving force behind agricultural production. The value chain in food dynamics is incredibly erratic. It is dependent on a barrage of factors, such as market forces; prevailing climatic conditions, end-user perception; political involvement; nutrition trends and consumer habits; perishability and versatility of use, to state but a few. *Farm-to-fork* can quite literally mean a social revolution. The producers as part of the value chain deliver their output and are the propagators of food as an end-product. While not the origin of the process of food production, for the purpose of this study, post-harvest farmers are considered the first handshake to food trade. This study envisions food as a finished product from the source of production after harvesting with the intention to distribute the end product to the consumer as its final destination.

5.3.1 Transportation of Food from Source to Point of Sale

Farmers, farmer-traders and traders endeavour the acquisition of food from sources of production through various means. This is dependent on: the quantity of produce, the type of commodity, the most appropriate means of transportation and the lowest risk applicable. Food, in this case, could be in its: **raw** form as with most fruits, tubers, vegetables, bulbs and rhizomes; as **processed raw** commodities as in the case of flour, honey, and animal products like meats and milk; or as **secondary processed** commodities like precooked/ parboiled foods, canned foods, dairy products and preserved/ processed meats. The discrepancy could either be considered negligible or substantial, depending on the expected purpose. In this case, the movement from source to market, is therefore dependent on the perceived source of commodities. As illustrated in figure 59 below, traders obtain food commodities from all over. The origins of food in periodic markets are not preconceived. Therefore, veritable consideration needs to accorded the divergent sources of the food sold at periodic farmers markets. For optimal profits, traders source their goods from varying sources: from the farmer-traders who market their own produce; traders

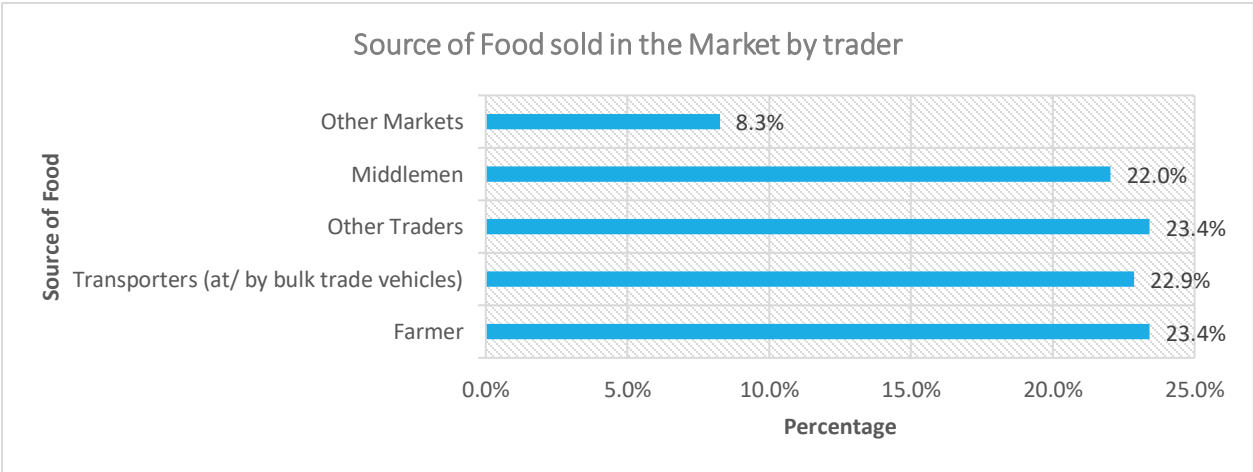


Figure 59: Source of Food Sold in Periodic Farmers Markets

who sell locally produced commodities; bulk traders who source produce from all over and market it where needed; and even local traders who deal in specific commodities that are strategically sourced from external markets intended for specific local markets. While the benefit to regional economics may be unquantifiable with all these elements in play, traders make the best of the situation by deriving profit for their efforts while also providing a highly necessary service in food provision to the region. As illustrated in figure 59 above, sources of food are determined by various components and the proponents all play a significant role in the supply as well as the resultant demand for the food products. While most food is produced on the farm, not all traders have direct access to the farms or farmers, hence the need for alternate options. For feasibility, these alternatives require mobility. That is, from source to markets. The transport sector is therefore directly involved in this trade. While considering the various sources and types of food, it is important to note that the diversity in the choice for modes of transportation is entirely based on the convenience and individual rationality of the farmers, farmer-traders and traders.

For long-distance bulk transit, the traders were more inclined to using lorries, canter trucks, pickup trucks as well as modified family cars with large interior capacity. This accounted for in figure 60 below, 11.8% and 29.1% respectively, of the transportation. These cars ferried goods from as far as: Arusha in Tanzania; Bungoma, Busia and Kakamega in western Kenya; Nyeri, Murang’a, Kiambu, Kirinyaga and Nyandarua in central Kenya; from Nakuru, Trans-Nzoia, Uasin Gishu, Narok and Kajiado in the Rift Valley; Meru, Embu, Kitui, Makueni in the eastern region; as well as from Garissa in north-eastern Kenya.

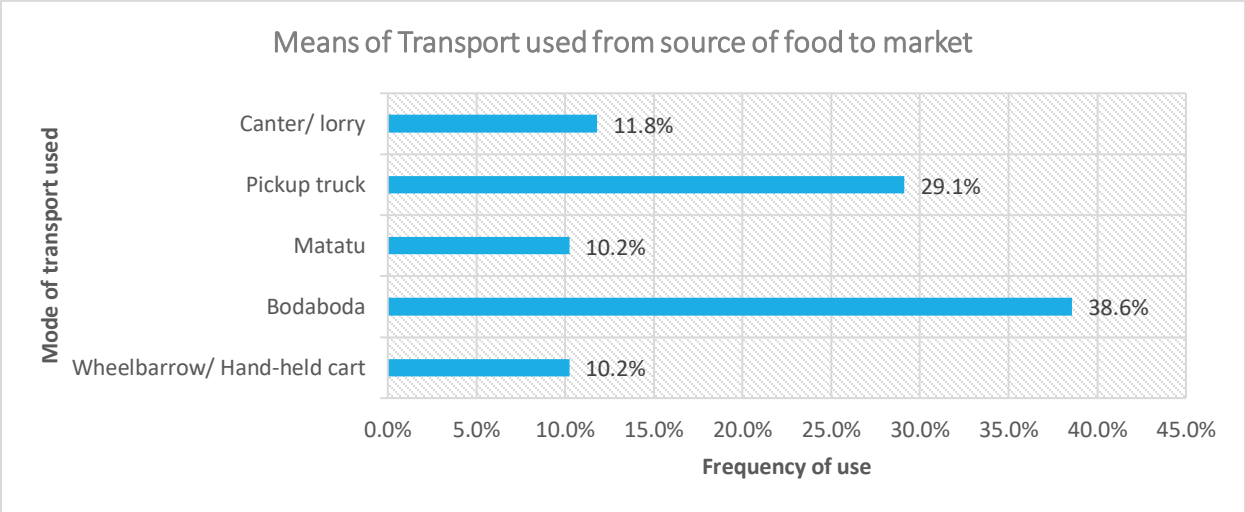


Figure 60: Means of Transportation Used from Point of Sale to Storage

For those travelling within the region, depending on bulk, the use of *boda-boda* was highly favoured at 38.6% with some relying on *matatu* for transportation accounting for 10.2% of the transport capacity. These periodic markets exist within the vicinity of farms and homesteads, as such, it is expected that

simple porters exist for the purpose of movement of goods. The use of wheelbarrows and *mikokoteni* (hand-held carts) accounted for 10.2% of the transport of food from sources to the market.

Upon arrival at the market, these food products are either sold directly; stored for future sale; sorted for re-distribution; or as in the case of some fruits stored for ripening. These factors determine immediate action accorded to the food upon delivery to the market or from point of sale. The food which is sold to the consumer is transported to where needed using available transport means. As a consequence of the periodic market, means of transport into and out of the periodic markets are numerous and readily available. Thus, there exist means for the movement of the food purchased. Consumers utilise various modes of transport based on the bulk of food procured. As shown in figure 61 below, the rural-hinterland-bound consumers, who purchase relatively smaller volumes of food commodities are able to acquire efficient transport using readily available motorcycles, accounting for 44.2% of all transportation. The consumers who procure goods in bulk for trade in markets further away, tend to be more inclined to use services from pick-up trucks and modified family cars with large interior capacity accounting for 28.4%. While considering that the livestock trade is part of the food trade, consumers that procure herds of livestock, bound for slaughter are more inclined to use canter trucks and lorries for transportation of the stock. Traders who move larger volumes of commodities such as cabbages also tend to prefer using the same. Collectively these account for 9.5% of the transportation. 3% of traders happened to have stores within proximity to the market stalls in which they operated. Consumers notably also purchased goods from other traders, especially wholesale traders and farmers who bring in goods in bulk, within the market and in turn trade in other parts of the same market. These food commodities are transported using simpler portage systems. These include hand-held carts, wheelbarrows and human porters. These cumulatively account for 11.6% of transportation within the periodic markets. It is important to note, that these means of transportation were either property of the traders or obtained on hire.

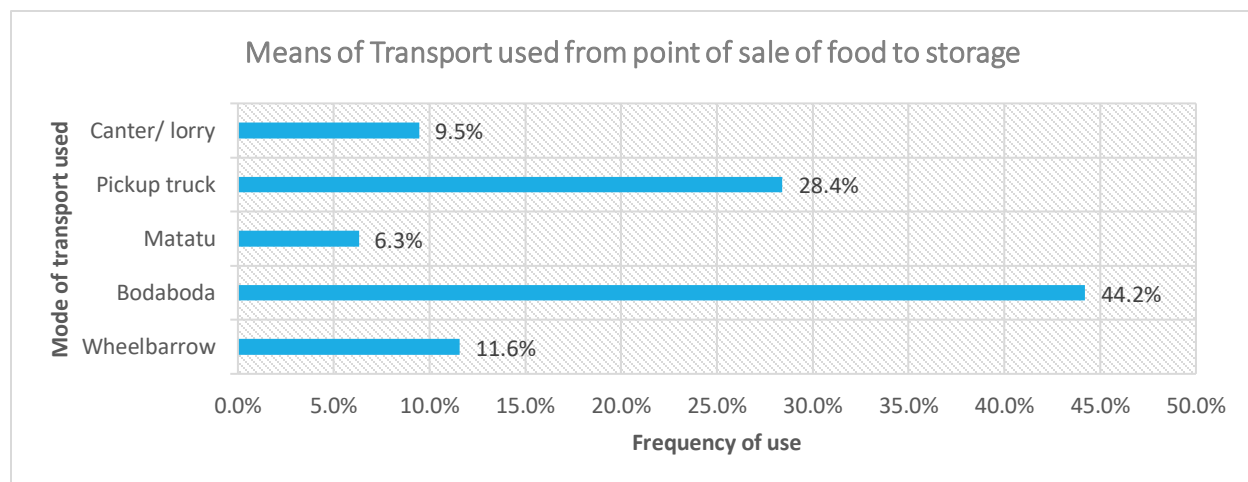


Figure 61: Means of Transport from Food Source to Market

5.3.2 Rural Resilience

This study envisions the periodic markets in the various capacities and responsibilities held by the markets. This includes wholesale markets, retail markets, periodic markets and as farmers markets. The distinction, while minimal on site, is very significant when considering the economic value of food trade as an isolated entity. As shown in figure 62, approximately 65% of the traders in the periodic markets rely entirely on food trade within the periodic markets as their sole source of income and livelihood. This illustrates the economic value of the periodic markets to participants in the trade, which highlights the financial bonds of the regional economy to the markets as centres for commerce. The other 35% with alternative sources of income comprise farmer-traders who trade in goods from the comfort of their own farms. It also includes civil servants who are farmers, availing their goods to the periodic market circuit upon harvest; as well as traders who participate in the trade of commodities other than food, within and outside the periodic market circuit.

Various factors are responsible for these numbers. One of them is the capacity to acquire financial aid in form of loans from banks, micro-finances and SACCOs. For both traders and farmers, acquiring credit proves difficult due to a lack of collateral, misinformation and fear of consequences in case of default. Instances of farmers losing their land and/or farms, livestock, vehicles, and personal holdings, seem to dissuade the majority of farmers from pursuing credit. Inadequate information on credit facilities is also responsible for the deficits created. As shown in figure 63, only 34% of traders, farmers and trader-farmers have access to external financial aid.

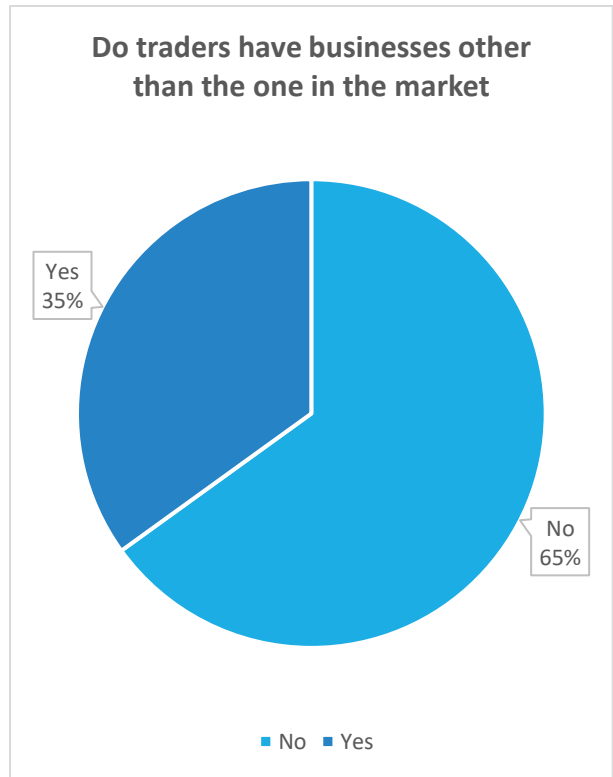


Figure 62: Economic Value of Businesses in Periodic Markets

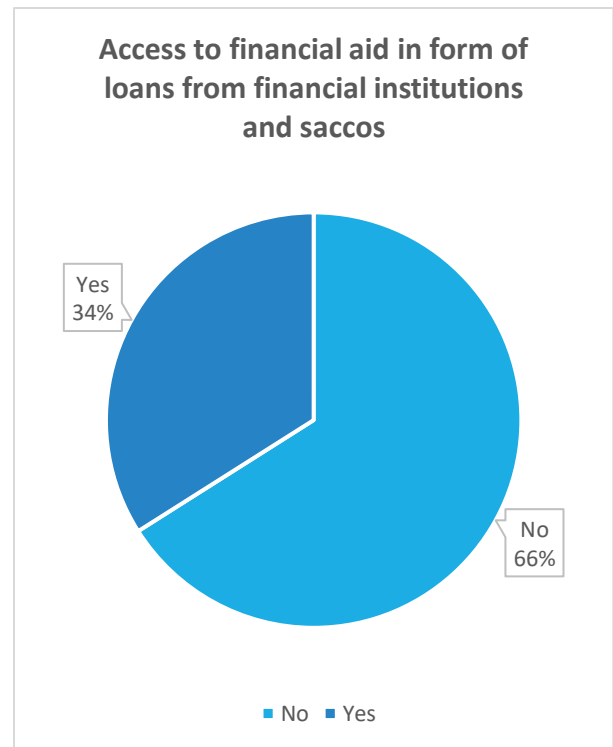


Figure 63: Access to Financial Assistance

5.4 Findings of Objective 4: Planning Interventions for Periodic Farmers Markets on Spatial Use

The land is an invaluable finite commodity. Never can this statement be considered truer than in the face of its deficiency. Periodic farmers markets are subject to by-laws and guidelines set by market centres, townships, and markets in which they reside. This is in regard to spatial location, operation hours, types of commodities sold, the number of commodities sold, and storage capacity. This can either motivate the participation of traders and consumers. Spatial-temporal planning of periodic markets is institutionalized for the purpose of the market centres concerned. It curtails the extent to which these markets operate, whom they serve as well as the manner in which service is provided. In the Masii-Wamũnyũ-Katangi periodic farmers market circuit, the inadequacies experienced as a result of lack of planning can be seen in the haphazard placement of trade stations, mismanagement of waste, poor location and inadequacy of sanitation points, as well as undefined mobility systems. While these tend to be brushed off as simple inconveniences to some, they risk creating or even escalating situations in the event of emergencies. For instance, in the case shown on plate 30, the space left between opposite stalls is approximately 1.2m.



Plate 24: Crowding in Katangi Periodic market. Image taken: 13/04/2022

This spacing is not defined by the market - as the traders display their wares on canvas laid out on the ground – it is left to the discretion of the traders. Thus, crowding, as shown in plate 24 is not uncommon. This translates to undefined exits and poor lines of vision for the users. The crowding within the paths is further enhanced by the lack of distinction between the pedestrian walkway, as well as the purchasing station for the customers. This may be considered a design flaw, had the designation been formal. However, the informality associated with the neglect in the planning of the market interiors poses a risk to both traders and consumers. This is because it risks damage to trader goods in the event of pedestrian tripping, the ground-based commodities risk being tramped upon by passer-by, the movement of people raises dust which contaminates the food on display, the shoving and pushing can cause accidents, where people may fall-over. And with the ongoing Covid-19 situation, it becomes difficult to control infection in the event of contamination within the market. These numerous factors allude to the appraisal of trade situations within the market, in a bid to understand what compels the use of certain types of stations, their sustainability, and possible implications to health, trade, movement, and also basic ergonomic space.

5.4.1 Type of Market Stalls Used by Traders

For the purpose of trade, participants in the periodic farmers markets utilise various stations as their trading areas. These include enclosed market stalls, *kibanda* - temporary roofed stalls, or open-to-air stations. The **enclosed market stalls** are more often than not constructed out of masonry, bricks or iron-sheets as seen in plate 25, and are often old as a majority of these are the initial inbound stalls defining the perimeter of the market. These are often useable all year-round. In the case of Masii, Wamũnyũ and Katangi, these stalls were either constructed during the inception of the markets or are installation by the county government for the purpose of revenue collection. The *vibanda* (*kibanda* - singular) are make-shift timber structures as seen in plate 25 which comprise a simple flat surface for display of commodities and a simple roof which can be made out of iron-sheet, nylon paper, canvas or may be open to sky.



Plate 25: Iron-sheet enclosed market stalls and vibanda in Masii periodic farmers market during a non-market day. Image taken 13/04/2022

Open-air stations are often used by periodic traders, who simply lay a canvas or sacks on flat surface ground as shown in plate 26, and use the top as a platform to display their wares. This scheme is so successful integrated into the periodic market that it is often adopted by traders with alternative trading stations as it is perceived to offer options for the display of more goods. Farmer-traders have been known to incorporate the open-air market system to increase their horizontal span for display.



Plate 26: Open-air trader in Wamūnyū periodic farmers market during a market day. Image taken 13/04/2022

The commodities sold notwithstanding; the trading station is viewed as a personal choice where traders decide on how their wares are to be displayed. And therein lies the basis of design and site planning. Spatial definition in a market is the foundation of its very existence. Spatial inequities can either make trade accessible or cumbersome. In the case of periodic farmers markets, this can determine the success or failure of a periodic market.

The Machakos County Government constructed market sheds in numerous market centres throughout the county. While, the conceptual project might have been in good spirit, the service delivery seemed to have fallen short of expectations. The lack of contextual knowledge, copy-paste design implementation and lack of public participation resulted in structural white-elephants that stand as eye-sores at the core of market centres all over the county. The market shed, as in the case of Katangi, remains neglected by the intended users, citing gross design failure. This is caused by the unsettling slope of the stations, which makes it difficult to display most food commodities as they are said to fall over due to the incline. Additionally, the size restricts the amount of space available to the traders, especially those who deal in larger commodities such as cabbages, melons and potatoes. The openings and resultant space are unable

to accommodate food. As seen in plate 27, provision of the small storage space beneath the display station seems to have been made as an afterthought. This compels the users to place their produce directly on the ground during storage due to the small size of the opening. This is ill-received as the traders more often than not use crates to store food for sale in attempt to keep them fresh and avoid sogginess caused by moisture. For the most part, the food sold is highly perishable and the storage of goods is mostly done at room temperature. So as to avoid decomposition, management of moisture is usually the primary concern for the traders. This is further aggravated by an uncomfortable angle of decline so as to access the storage compartment. This proliferates accidents from strain or poor grip due to physical inconvenience of the movements created. As such, these sheds remain unoccupied, derelict and unsightly. No attempts have since been made to address the problems highlighted, regardless of the negative reviews given for the unusable structures. They have been termed as unfavourable, inconvenient and even dangerous by some of the traders and are more often left to alternative uses such as: sleeping benches for market porters, as platforms to dry washed sacks, or as a place to temporarily place goods bought from the market for later collection.



Plate 27: Neglected Market shed provided by the County Government of Machakos for Katangi market, during a market day in Katangi food market during a market-day. Image taken 13/04/2022

5.4.2 Place Identity in Periodic Farmers Markets

Either in search of convenience, contextual knowledge or by design, the most preferred market station for use in the periodic farmers markets was the open-air system. Be it with an extension to an existing stall, as the primary station of operation, or as an addition to tailgate traders, these stations account for over 53% of all trading stations within the periodic markets. They are sometimes accessorised by temporary shading, in form of a stretched nylon sheet or canvas as seen in plate 28. The number of traders who use *vibanda* (roofed stalls) stands at 32% as shown in figure 64. This population also accounts for the traders who only occupy one market throughout the week. The sheds are used when needed and can just as easily be abandoned. The traders who occupy enclosed stalls account for only 18% of the total population. It is important to note that these traders, either operate general purpose shops with diverse commodities or they use these stations as shops as storage after a market day.



Plate 28: Open-air market stations with make-shift shading used by traders during market days in Katangi food market during a market-day. Image taken 13/04/2022

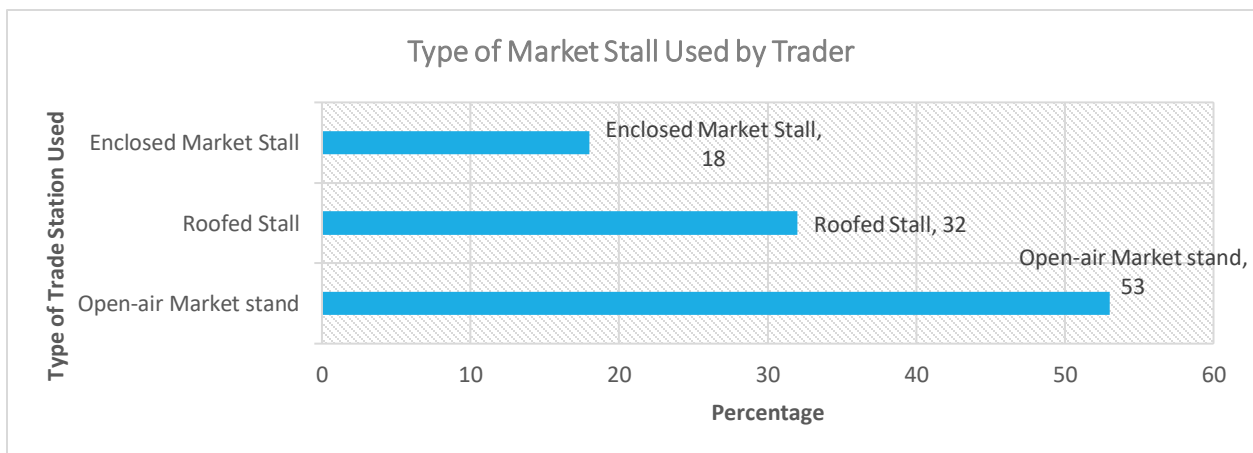


Figure 64: Type of Market Stall Used by Traders

Each trading station has cost implications. For instance, the cost of operating an **enclosed station** depends on the ownership system in place. For the county-owned stalls, as in the case of Wamũnyũ market centre, there are the ‘unit owners’ and the ‘operators’ in the markets. The operators pay rent to the ‘unit owners’, who later pay annual land rates, at an average of Kshs.330, to the county government of Machakos. This system has been in place for longer than most can remember, with some of the enclosed stalls being over 30 years old. They were built on the market centres by the so-called ‘unit owners’, which in a way explains the local arrangements for the remittance, and the rigidity of the market structures. From this study, the largest number of operators of the enclosed stalls was seen to be the renters. They stood at 10.7% of the total population. The so-called ‘owner-operators’ in the case of the enclosed stalls were considered ‘lease-holders’, as they paid an annual fee for renewal of the lease to the county government of Machakos. This status was subject to approval or revocation at the leisure of the county government. However, there were no recorded cases, from the occupants of the market, of a leaseholder being evicted.

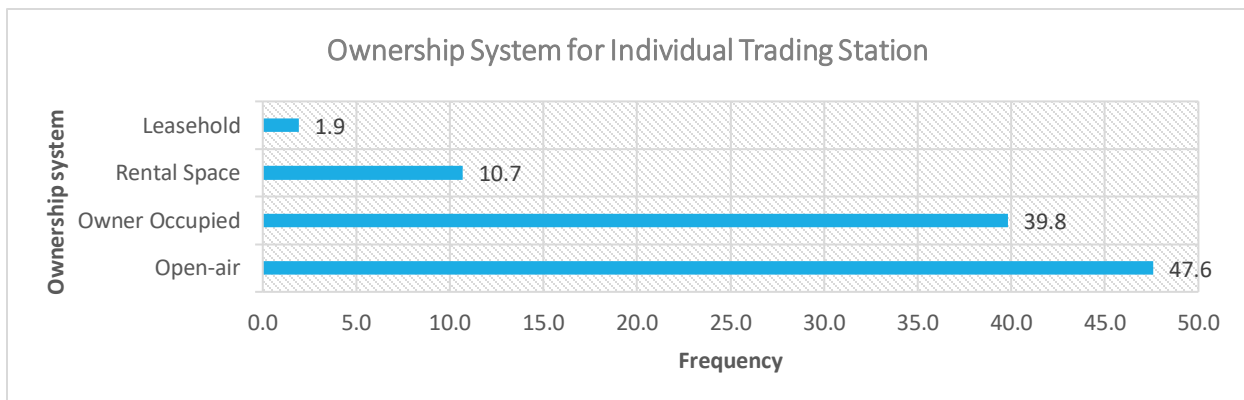


Figure 65: Ownership system of individual trading stations in periodic farmers markets

The largest population of traders within the farmers markets are notably the open-air traders who operate on ground-lain canvases. They account for 47.6% of the entire population. They rely on temporary sheds made from a loose covering to shield them from the elements. 37% of the vendors occupy *vibanda* which are constructed from personal resources. These traders are considered to have semi-permanent residency within the markets they reside. They take part in the periodic market circuit by operating away from their station 2-3 days per week but work dominantly from a given station even on regular days. These form a major part of the 39.8% seen above as their stations, though informal is still considered private property. These traders are more commonly referred to as ‘*Mama-mboga*’. Their status is so unique to each market that it begs recognition from even the county revenue authorities. The *vibanda*-operators are considered resident occupants of their resident markets, regardless of the number of days they operate. As such, they are exempt from paying market-day levies to the county government in form of daily rates as in the case of other operators of the markets. Among their attributes, including the fact that they are the ‘voice of the market’ when the need arises, they are considered the **de facto** traders in their respective resident markets.

Spatial Considerations for Periodic Markets

Design informality is almost synonymous with periodic markets. The organisation of any periodic market is dependent on the capacity to comprehensively reflect the need matrices of various traders as stakeholders. This is while considering how instrumental they are in the street morphology, socio-economic capacity of rural market centres, and regional development. On average, this is best illustrated through the appraisal of the spatial-temporal factors attributed to these markets. In regard to space figure 66 below elucidates the average sizes and their relative frequencies of the market stations within the Masii-Wamünyü-Katangi periodic farmers market circuit.

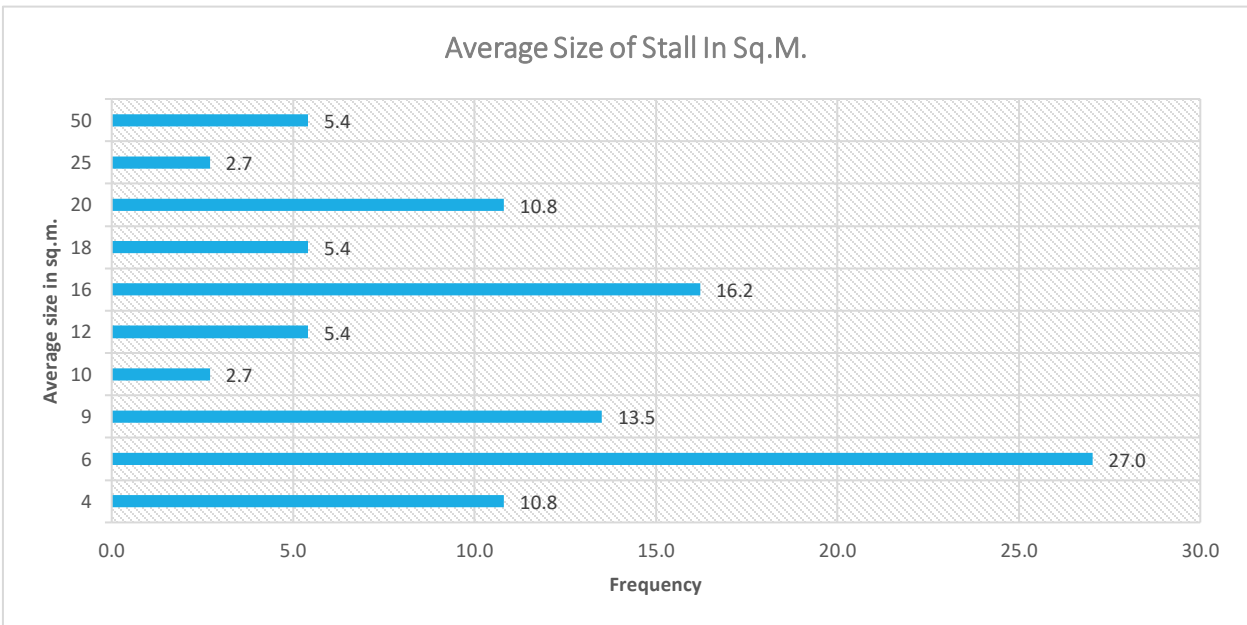


Figure 66: Average Size of Stalls in The Masii-Wamünyü-Katangi Periodic Farmers Market Circuit

This analysis is a joint spatial assessment encompassing the various market stations. They include open-air trade stations, *vibanda*, as well as enclosed stalls. The mode stood at 6m² with a frequency of 27%. The smallest recorded size was 4m² while the largest was 50m². The traders with larger spatial needs were the bulk traders, dealing in cabbages, bananas/plantains, and onions. The large, homogenous displays were spread out to allow for more traders to make simultaneous purchases. While this proved successful for the traders, it was rather unsustainable as it reduces space for other traders. This was especially visible for traders operating within the designated market. The larger the spread by single-holder bulk traders, the higher the number of smaller-holder retailers on the spill-over spaces outside the market. This correlation is owed to the rigidity of the market design. In the case of the *vibanda*-operators, the initial cost of stall construction is factored in to appraise cost estimates for design specifications.

The initial construction cost ranged from Kshs.200 to Kshs 80,000 depending on the size and type of stall, as well as the capacity for use and storage. As seen in figure 67 below, the frequency differed based on the innate differences among traders. In some cases, the structures were identical in size and form, however, the difference in materials used in construction offset the cost quoted. This was seen across the three markets.

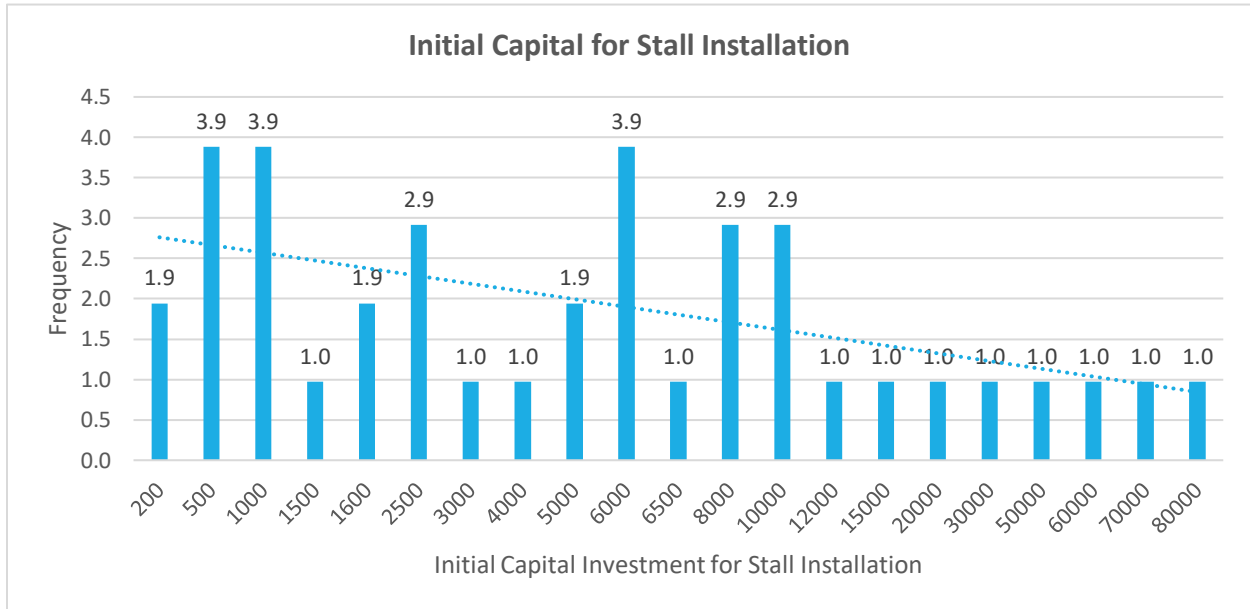


Figure 67: Cost Estimate for Initial Capital Investment in Stall Construction

In the case of rented spaces for both the enclosed stalls and rented *vibanda*, the prices are based on size across the three markets. For enclosed stalls, older tenants were only required to pay annual rates, while the rest had to pay an average rental price of Kshs. 5,000 per stall. For those using stalls for storage, the rental price ranged from Kshs.1,500 to Kshs.3,000. In the case of *vibanda*, renting was unregulated but coordinated. The stalls were strategically erected for optimal access and visibility. The rental cost for *vibanda* ranged from Kshs.500 to Kshs.1,500 depending on location, size and type of structure.

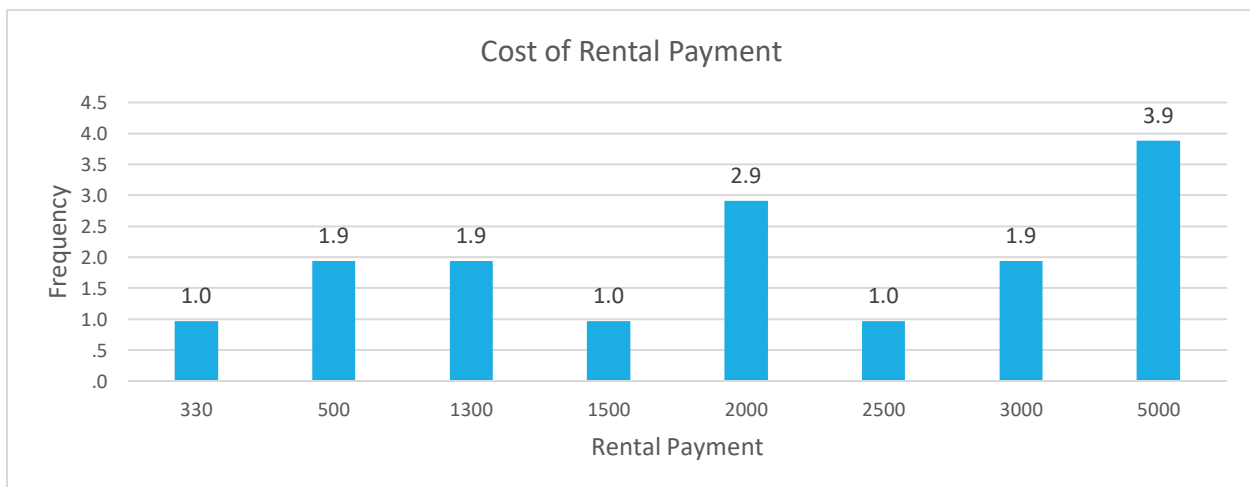


Figure 68: Cost of Rent for Market Stalls and Vibanda in Periodic Farmers Markets

For both temporary and semi-permanent structures, maintenance is a constant in the built environment. In the case of *vibanda*, the process of wear and tear is a combination of mechanical damage of the station due to natural degradation, and termite damage as a wooden construction. This means anything from the replacement of timber sections to total reconstruction. Due to the simplicity of the structures, rebuilding and renovation hardly exceeded a single day’s worth of service. This was however dependent on the availability of required building materials, which was often determined by the availability of resources to procure the components. These repairs set back vendors an estimate of between Kshs.150 to Kshs.6,000 as elaborated in figure 69 below.

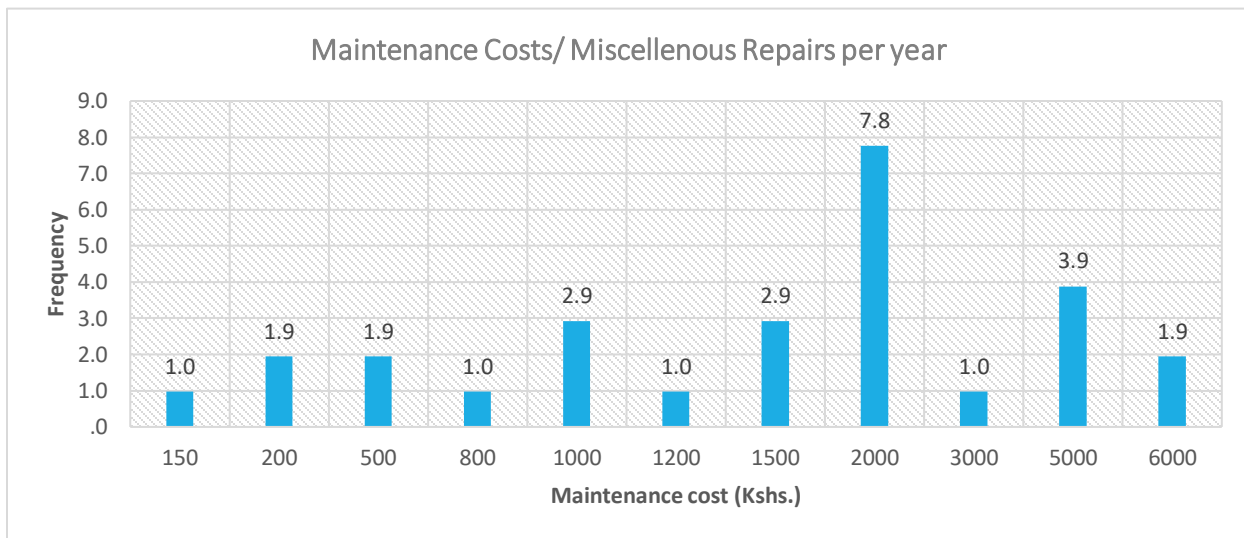


Figure 69: Maintenance costs for stalls in Periodic Farmers Markets

In regard to rates and levy payments remitted to the county revenue officers of the county government of Machakos, the payments made by the various vendor notably differed from place to place and over time. The traders indicate that the payment requested by the county revenue officials seemed subjective, as they were uninformed of how the costing was done. They unquestioningly paid what was requested and obtained a receipt for it, no questions asked.

The following information from the Machakos County Finance Bill, 2020, the fees for operating in any market are shown in table 5. It breaks down the required payments for categoric commodities based on amounts, location, and status of the product. While this data is important and readily accessible from the Machakos County website, the content seems not to have been physically disseminated to the vendors for whom it is intended. Its unavailability is basically due to a lack of information on its very existence to the local vendors, rather than it not being public information, as it candidly is.

Table 5: Payments by Mode of Sale by Market Operators to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
HAWKING	KSHS.	KSHS.	KSHS.
Small-scale Hawker permit per month	500	200	100
Motorized hawkers per day with:			
Tuktuk/ Maruti	100	100	50
Pickup/ Nissan	500	500	400
Canter trucks	1,500	1,500	1,500
Lorry	1,500	1,500	1,500
Penalty for hawker selling to moving vehicle	5,000	5,000	5,000

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

For the open-air market operators, it was common to pay between Kshs.20 to Kshs.50 per day so as to display agricultural produce for sale. For medium to bulk-trade operators, the range was between Kshs.100 to Kshs.500. For operators who sold their commodities alongside their vehicles or modes of transportation, the rates ranged from Kshs.500 to Kshs 2,000 as seen in figure 70 below. The vendors indicated that they were not aware of an existing standard for measure of commodities to determine the payments made to the county. The only thing that was certain was that a fee was to be paid to the county revenue officials. While it is important to note that adherence to county remittance is imperative for revenue collection, a lack of public awareness on the extent of impact could potentially spell chaos in the event that a fault in the system allows for public exploitation. Lack of knowledge on the part of the taxpayers within the periodic markets was severely wanting, leaving a lot to be desired.

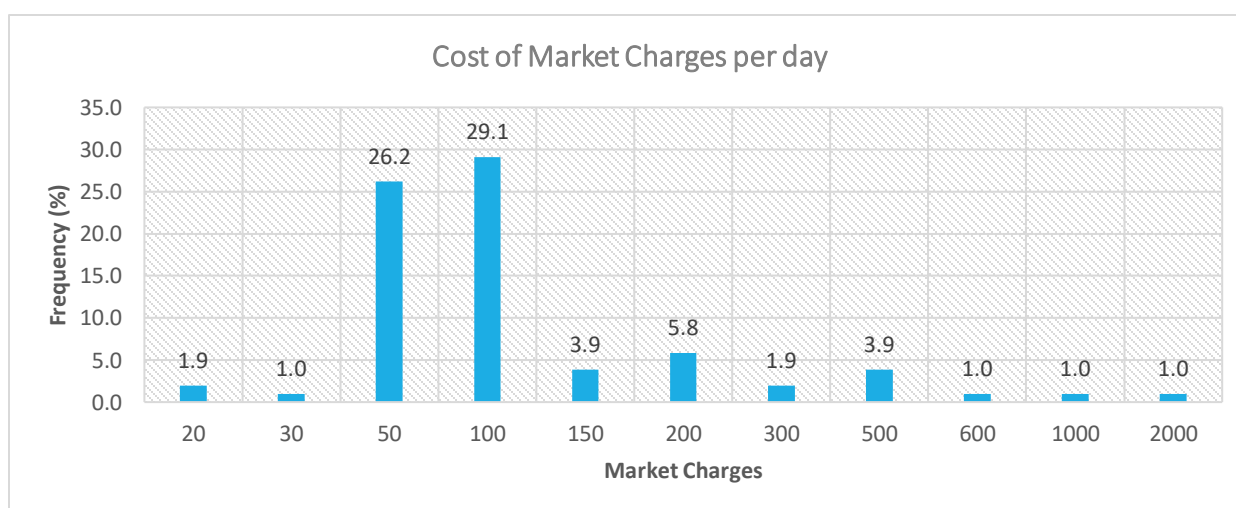


Figure 70: Cost of Rates and Levies to The County Government of Machakos for Traders in Periodic Markets

Table 6: Payments on Retail Goods by Market Operators to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Public Markets and stalls	KSHS.	KSHS.	KSHS.
Bow & arrow	5	5	Charges For rural markets proposed to be zero rated
Bow	3	3	
Arrow	3	3	
Quiver	3	3	
Cereals per bag (90kg) (Dry foodstuffs)			
Maize	60	50	
Rice	60	50	
Ndengu	40	30	
Njugu (ground-nuts)	60	50	
Black beans (<i>njahi</i>)	40	30	
Peas	30	30	
Beans	30	30	

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

Table 7: Payments on Wholesale Trade by Farmer-Traders to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Produce & vegetable per bag (90kg) - wholesale	KSHS.	KSHS.	KSHS.
Carrots	30	20	For rural markets proposed to be zero rated
Onions	60	40	
Green vegetable	20	10	
Green maize	40	25	
Pumpkins	50	20	
Yams	60	20	
Sweet potatoes	30	25	
Cabbages	30	25	
Cassava	20	10	
Potatoes	30	25	
Arrow Roots	30	25	
Sukuma wiki (kale) (per 90kg)	20	10	
Spinach	20	10	
Cauliflower	40	30	
Cucumber	40	30	
Dhania (coriander) (per 90kg)	40	30	
Pili-pili hoho (Capsicum) (per 90kg)	30	20	
Whole Spices (per bag)	30	20	
Butternut squash (per bag)	40	30	
Courgette (zucchini)	40	30	
Pepper (pilipili-kali)	30	20	
Tomatoes small-crate	30	20	
Tomatoes medium-crate	40	30	
Tomatoes large-crate	50	40	

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

Table 8: Payments on Wholesale Trade of Goods by Market Operators to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Extended 90kgkgs bags (wholesale)	KSHS.	KSHS.	KSHS.
Green maize	50	40	For rural markets proposed to be zero rated
Green vegetables	50	40	
Carrots	60	50	
Potatoes	40	30	
Sukuma wiki per extended bag	50	40	
Pumpkin per extended bag	60	30	
Green peas	50	40	
Sweet potatoes per extended bag	40	30	
Fruit per bag (Wholesale)			
Oranges	30	25	
Pawpaw	30	25	
Passion	30	25	
Citrus	30	25	
Tomatoes	30	25	
Horticulture – <i>misanzi</i> (green beans)	30	25	
Bananas (sweet)	30	25	
Mangoes	30	25	
Onions small net (6kgs)	30	25	
Onions big net (13kg)	40	30	
10 sugarcane bundle	30	20	
10 cassavas	30	25	
Banana per bunch	30	20	
Watermelon per tonne	700	500	
Avocadoes per bag	50	40	
Avocado per extended bag	70	50	
Mangoes per extended bag	50	40	
Sisal strings	30	25	
20 ropes	30	25	
<i>Miatine (Kigelia africana)</i>	30	25	
<i>Kyondo</i> (traditional Bantu basket)	30	20	
Mat	30	20	
Pot	30	20	
Tray of eggs	30	25	
Chicken, quails, birds, etc.	20	10	
Fish-monger hawking per day	20	20	
Fish traders using pickups per day	200	200	
Tin of spices	20	15	
Seedlings	20	10	
Tin of ghee	20	10	
Tin of sour milk (Kikuyu)	30	20	
1-5kg of jigger sugar (ngülü)	30	25	
Hides per piece	30	30	
Skin per piece	30	20	
Snuff ¼ tin	30	20	
Bag of charcoal	40	40	
Banana per bunch	30	10	

Vegetable sellers outside the market paid daily	40	20	
Bicycle repairs per day	30	30	
Shoe shiner per day	30	30	
Hardware (mali-mali) per day	60	30	
Shoe-seller per day	60	30	
New and second-hand clothes per day	100	60	

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

Table 9: Payments on Wholesale Trade by Mass-Transit Operators to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Seller using vehicle	KSHS.	KSHS.	KSHS.
½ ton	200	150	150
1 ton	300	200	200
2 ton	400	300	300
4 ton	500	400	400
Over 4 ton	800	600	500
Cabbages			
½ ton	300	250	250
1 ton	400	300	300
2 ton	500	400	350
4 ton	1000	1000	1000
Over 4 ton	2000	2000	2000

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

Table 10: Payments on Livestock Trade by Traders to Machakos County

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Stock fees per head	KSHS.	KSHS.	KSHS.
Cattle, donkeys, camels	80	80	80
Goats, sheep, pigs	30	30	30
Livestock brokers per year	2500	2500	2500
Livestock traders other than brokers per year	3500	3500	3500
Movement permit per head			
Cattle, donkey, camel	100	100	100
Goats, sheep, pigs	50	50	50
Camel	200	200	200
Chicken	20	20	20

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

Table 11: Payments on Farm Produce Inspection

PUBLIC MARKETS AND STALLS			
DESCRIPTION	URBAN	PERI-URBAN	RURAL
Farm Produce Inspection Fees (CESS) Per 90kg bag	KSHS.	KSHS.	KSHS.
Beans	30	20	20
Mangoes	60	30	30
Ndengu (green grams)	60	40	30
Oranges	60	40	30
Pawpaw	60	40	30
Black beans (njahi)	60	30	30
Watermelon	80	50	30
Cabbage	30	30	20
Cassava	60	40	30
Arrowroots	30	30	20
Pumpkins	30	30	20
Green vegetables	40	30	20
Charcoal	30	20	20
Maize (dry)	40	30	20
Maize (green)	60	40	30
Onions (leafy)	60	40	30
Potatoes	60	40	30
Carrots	30	30	30
Horticultural and other Farm Products for Export			
Flour per crate	SBP	SBP	SBP
Fruits per crate	SBP	SBP	SBP

Source: Adopted and modified from: Machakos County Finance Bill; Third Schedule - Fees and Charges – 2019

(Machakos, 2020)

According to the Machakos County Finance Bill, 2019, products under the care of traders require quantification before sales are made. This, if put to practice as provided for in the financial bill, would result in relatively higher costs than are locally administered to the vendors of food commodities within the periodic farmers markets. While the idea of being in a market centre seemingly defines the market vicinities as ‘urbanising’, the rural setting in which they reside makes them rural. So, drawing the line between peri-urban and rural in this case is subject to interpretation by the county government. This is also while considering that there currently does not exist a county spatial plan for Machakos County, as of the submission time of this report.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

With the fourth consecutive below-average rainy season experienced in south-eastern Kenya, the situation on food security is constantly gravitating towards famine. The deteriorating food security is aggravated by failed crop production, poor replenishment of livestock especially bovines, increased accounts of crop pests and diseases in the areas which rely on irrigation within the small food production pockets of the catchment area, rampant livestock diseases and immunity deficiencies due to exposure to hunger. Then the axle breaks with the Covid-19 pandemic, which has become the gift that keeps on giving. In February 2022, KFSSG's annual Short Rains Assessment reported an estimated 3.1 million food-insecure people in ASAL areas¹⁵. The report indicates how crop production was significantly impacted by the late-onset, poor temporal distribution and comparatively below-average rainfall during the October to December short rains, which resulted in the below-average harvest.

In the study area, failed rains spell doom. Not only is the crop production practiced significantly dependent on rainfall, but the basis for all agriculture and daily life is also climate dependent. Poor rainfall translates to low surface run-off and low water recharge of both public and private water pans; fluctuations in the water table from which all groundwater is obtained, and also reduced viable water points for public use. This diminishes the water available to the people; to a point of a complete scarcity of locally-produced food. This shortage eventually compels the migration of wildlife, pests, and parasites. Due to proximity to the Athi river, Wamũnyũ, Miondoni, and Katangi market centres record annual human fatalities as a result of human-wildlife conflict caused by this seasonal famine and water scarcity. When the rains fail and grazing land disappears, hippopotami migrate to human-occupied areas in search of feed and water. This always results in fatalities, of both people and wildlife. This is a crisis, which calls for address as both sides deserve to live.

6.1 Summary of Findings

While the idea of territorial growth is significantly helpful as far as the availability of food for human consumption is concerned, low purchasing power makes these initiatives difficult for both traders and consumers. Financial shortcomings in the study area were clocked on five major factors. First, four years of consecutive failed rains have severely strained the economic capacity of the region. Second, increased pest population due to desertification and the vast migration of insects in search of feed in the few pockets of agro-production within the region. Third, hyperinflation impacts the standards of living due to the

¹⁵ <https://fews.net/east-africa/kenya/food-security-outlook/february-2022>

declining value of the Kenyan Shilling. Fourth, the unsustainable reliance on imported food from external markets and sources results in significantly higher prices than can be accommodated by many financially unstable residents. Fifth, lack of local resources, besides labour, of significant economic value for external revenue acquisition as well as 'loss of income and/ or unemployment in the aftermath of Covid-19. This puts the local communities in a bind. It results in the conversion of labour from food production to service provision, as wages continually become the dominant source of revenue for a majority of households.

6.1.1 Summary of Findings on Food Security

Food Security needs to be discussed as a consequence of trade. The creation of total dependence on inbound food is extremely dangerous as was noticed during the Covid-19 pandemic lockdowns. The closure of markets put huge populations at risk of starvation due to the distortion of the supply chains. The ability to feed themselves is taken away from people when the environment in which they perform the activity is made hostile and/ in inhospitable for agriculture.

6.1.2 Summary of Findings on Food Deserts

Food Deserts exist in both urban and rural areas. The lack of nutrition or inadequacy of the same results in malnutrition, poverty, famine, and insecurity. The chances of people resulting in unconventional or even extreme means for the acquisition of food define the failure of a civilisation. The first step to understanding this phenomenon is acknowledging that Food Deserts exist, identifying where they reside, and comprehensively appraising the situation that created them in the first place.

6.1.3 Summary of Findings on Sustainable Agriculture

Sustainable agriculture, which could mean **conservation agriculture** or **intensive ecology-sensitive agro-industry**, involves initiatives that go a long way in ensuring the success of sustainable food production. This has a direct influence on trade, agro-industry, contextual socio-economic capacity, and the food market at large. It allows for a better appreciation of the process of food production; as well as independence in the creation of vast opportunities availed by the unique, yet incredibly diverse industry. This includes the ability to positively impact an entire region on a niche that could change the socio-cultural and economic dynamics of a marginalised area. Sustainability in agriculture results in better accommodation for various **food supply chains** by increasing available options and an array of opportunities through the same.

Sustainable communities are rooted in interconnectedness. This is a conscious effort made from territorial development. Socio-economic development is determined by collective effort in rationalising food as an entity for public interest as well as an opportunity for individual investors. An empowered society can evolve into a sustainable community, where trade is not a result of dire need but a feature of

investment. Where farmers trade in surplus for economic gain, rather than disposing of the last possible source of revenue as in the case of selling the last cow, to fix a leaking roof.

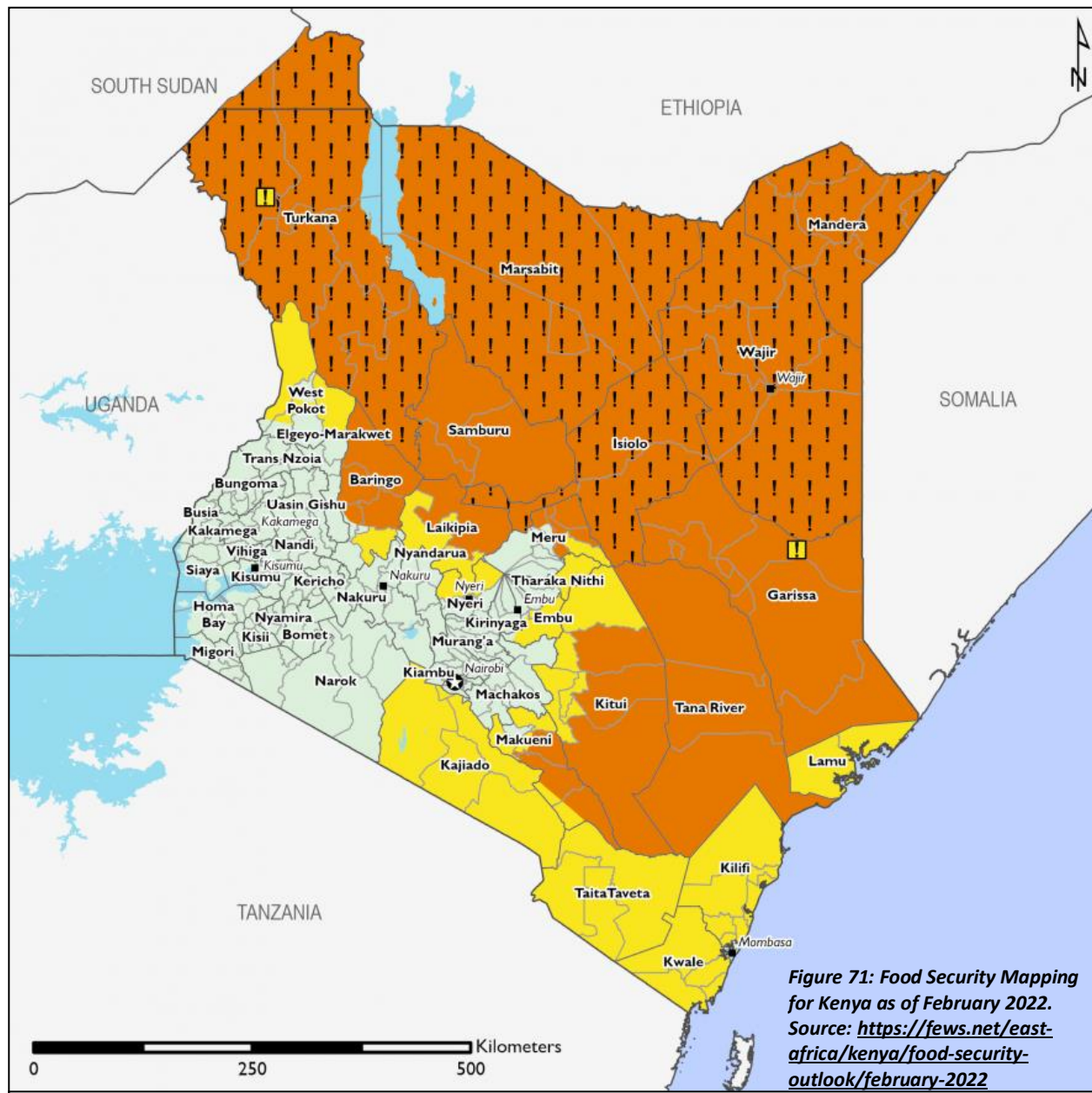


Figure 71: Food Security Mapping for Kenya as of February 2022.
 Source: <https://fews.net/east-africa/kenya/food-security-outlook/february-2022>



Figure 71 shows Kenya’s food security situation, depicting the production and non-production areas. The nutrition needs of the entire country are dependent on a handful of counties. Other factors considered, issues of low economic value on agricultural land are continuously becoming a crisis resulting in food baskets changing land use from agriculture to human settlement. This may not directly affect the regions

in context but it has far-reaching implications for the rest of the country, which holds them responsible for feeding the nation. The land is an invaluable resource. Arable land especially, as it can define a nation's very sovereignty. The study area falls under the category of 'crisis' and correctly so, as the availability of land, devoid of appropriate technology to harness water for agriculture, renders the semi-arid land unusable for agricultural production. This results in the need for periodic markets. The food and livestock markets remain the primary source of food and nourishment for the local communities, a consequence of geographical disadvantage. This indicates the value that periodic farmers markets hold for such areas. This is not simply an issue of socio-economic empowerment but rather an initiative to feed an entire population living in food insecurity within a country where arable land is critically low and at high risk.

Desertification is a looming catastrophe in the study area. This is a consequence of colliding climate-related socio-economic issues convoluted to the disadvantage of a people in crisis. When the rains fail, the local population lacks the revenue to sustain their livelihoods. They are left without food, resources, and a source of income. Once the grazing land disappears due to drought, livestock is disposed of to reduce the risk of death. What remains after this are the few scattered indigenous trees. As a last result, the locals cut down the trees to make charcoal, which is later sold for food. The problem with destroying indigenous flora is that regardless of replenishing efforts once rain falls, these trees take decades to mature. The indigenous trees take about 40 years on average to mature for harvesting wood fuel. However, once chopped, they can only provide fuel for an average of two months. That brings to light the need for public awareness, regional planning, agricultural planning, conservation agriculture, water protection, and harvesting; and most importantly **contextual community asset mapping**.

6.1.4 Summary of Findings on Periodic Farmers Markets

Periodic Farmers Market have been envisioned as a solution to equitable distribution of resources, food and trade commodities to otherwise marginalised areas. This is not always the case. Dependence grows when one need is used to justify the lack of initiative to solve the underlying problem. Failure in agriculture in some areas propagates success in food trade in others. This may seem profitable initially but the advantage is short-lived and unsustainable when the matter of diminishing purchasing power joins the dynamics. Trade and exchange motivate growth and development. But when poorly initiated, this can lead to the devastation of an entire population, necessitating this study and others of its nature.

Spatial planning for Periodic Farmers Markets has proven to be a contextual necessity. As it helps with the definition of the vital centralised entity. As a human need, food has very specific requirements, both in nutritional value and the nature in which it is handled and expected for consumption. The ability or lack thereof to feed a population can be a cause for upheaval. Which, in this case, need not be. The networks to sustain food distribution within the regional context already exist, all that remains is ensuring that they

hold. Establishing a spatially planned market for the sole purpose of food can brand an entire socio-economic system. Reduction of waste, maximisation of output, optimal value addition, and increased visibility as some of the outcomes of an elaborately planned market. These factors can justifiably create avenues for optimal socio-economic empowerment for the entire region. While it is known that the built environment has no ability or capacity to influence the socio-economic environment, a market is not solely physical, it is the embodiment of rural and agro-industrial place identity. This shows the importance of order and defined principles for its establishment. The form of markets definitively follows their intended function.

6.1.5 Summary of Findings on Post-Pandemic Rural-Urban Linkages

Sustainable post-pandemic rural-urban linkages constitute a significant portion of the imperative discussions that the global south needs to have. In the wake of a pandemic, the seams of dependence came undone. The needs not met individually were put on display in the vilest of ways. The world realised that in the wake of disconnection, some people would die for the most remarkable of reasons. It revealed how delicate supply and demand can be especially where food and water were concerned. And this could not be truer in the Arid Semi-Arid Lands which define 90% of Kenya's land mass. Food is not a luxury and as such should it never be perceived. Avenues for trade and opportunities for its distribution need intricate understanding to avoid the crises felt during lockdowns that accompanied the pandemic. Global warming, climate change, and international financial dependence cannot be changed by a simple decision as has been realised. However, planning for food and how to acquire it need not be made a political muddle.

6.2 Conclusion of Findings

A region is quantified as a summation of the individual clusters and the characteristics which define them within interconnected systems. Territorial development involves spatially integrated systems that are both endogenous and either attract or repel external influences. Thus, periodic farmers markets form a character that brings together an entire region for the purpose of the collection and distribution of resources. Of interest in this study was the potential for the periodic markets in curating regional development using a multi-modal approach.

At the core, rural development in ASAL areas in Kenya is relatively similar. Meeting basic needs comes first, with food and water at the forefront. Access to nutrition is however compromised due to the Food Deserts, more so for the regions with dwindling populations, areas far away from large towns, and areas affected by adverse climate, especially drought. Periodic markets avail an avenue for rural areas to interact in a relatively even spatial setting due to the mobility of commercial activity. While the markets are not a daily occurrence, the market venue remains constant. As such, the need arises to accommodate the increase in population of both the activities and people. This may be in form of an increase in

investment in alternative businesses for the purpose of tapping into the traffic, or the horizontal growth of the centres in response to security, access to amenities, and perceived developments. This is however a unique take, as is seen in the study area. Two decades on, and only one out of all the market centres along the Machakos-Kitui road periodic market circuit has recorded any significant physical development. An increase in land value notwithstanding, economic growth is not equitable for the rest of the markets as the underlying factor remains unchecked, the local purchasing power. The lack of natural resources is partly to blame as the only exploitable resource in these areas is human labour. This however can be considered as both a positive and negative indicator. Positive in that it gives room for planning before development, allowing time for public awareness and public participation in the generation of plans. However, slow physical development is a symptom of low economic capacity, which negatively plays into the perception of economic importance and the needs of the community.

6.3 Recommendations

Upon conclusion of this study, the necessity arose to make proposals for the benefit of the region with the intended purpose of accommodating the '*Potential for Periodic Markets as Nodes of Food Trade and Territorial Development.*' These included suggestions on spatial-temporal considerations on analysis, asset mapping, and rural, urban, and regional planning. The breakdown of this is featured below.

6.3.1 Mapping for Agricultural Potential

Based on a location of significant agro-industrial dependence, the creation of a schematic to identify the best opportunities that can be derived through agriculture for the benefit of the people would go a long way in ensuring the sustainability of the area. Mapping the potential areas for specific needs would be vital in availing of point-precise empowerment for optimal agricultural production. This reduces the amount of external effort needed to avail conditions for practices that are not well suited for an area. This will involve: climatic; geological; geographical; ecological; environmental; economic and physical appraisal of the entire region collectively and intently for optimal results.

6.3.2 Mapping Periodic Markets Based on Activity, Scale, Location, Scope, Potentials, and Resources

Mapping of all periodic markets within the regional context of the dominant Masii-Wamũnyũ-Katangi periodic farmers market circuit in Machakos County is important for the determination of geographical scope. This will facilitate a comprehensive understanding of market dynamics, supply chains, distribution networks, and resultant food deserts. It creates a visual denotation of all markets in the regional context and their individual need matrices. This allows for spatial-temporal analysis from which Local Physical and Land-Use Development Plans, Local Physical Development Plans, and Regional Physical Development Plans can be derived and generated.

PERIODIC MARKETS

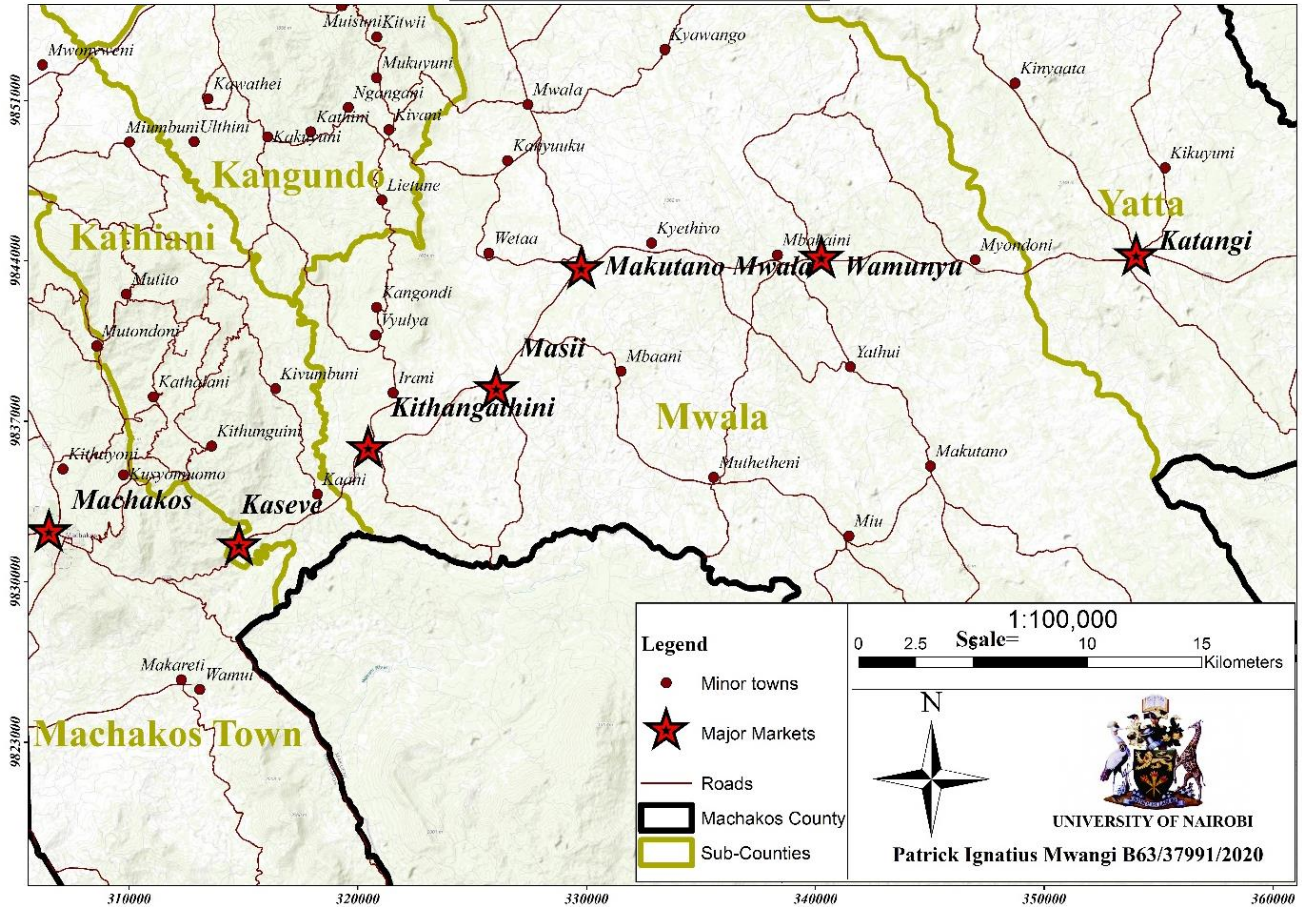


Figure 72: Map of periodic markets in the regional catchment area of the Masii-Wamunyu-Katangi periodic farmers market circuit in Machakos County

6.4 Asset-Mapping of Periodic Markets.

This is a means of gathering information about strengths and the resources available to a community. It is done with the aim of deriving solutions and eliminating deficits within the community. The inventory depicting community resources in form of graphical maps can be broken down into six thematic community assets worth considering. These comprise economic assets; available institutions; co-operatives and community-based associations; Physical assets; Residences and Housing; and native knowledge. By use of trend analysis, asset maps, and land-use plans, the ability to determine the resources and capacity available for each individual market is important to define its socio-economic impacts. The asset maps are important for the conceptualisation of new local programs and projects. They help identify the strengths and weaknesses of the community and enable the convenience of decision-making. They assist in resource mobilisation and empowering the community, especially with regard to local public service providers. And most importantly, public awareness, social learning, information dissemination, and public participation.

6.4.1 Agricultural planning and best farming practice in semi-arid areas

Rural planning in Kenya directly involves planning for agriculture, agro-industry, and agronomy. This creates room for interrogation of the rural landscape as a planning scope based on its bespoke characteristics and needs. The planning of these areas would require interaction with various disciplines as is the norm with physical planning to ensure best practice solutions can be derived. This would include the interrogation of the *Geddesian Triad* integrating people, context, and economy. Whereby the solutions derived would benefit all three in a symbiotic manner for sustainable growth. These disciplines include **economists** – due to the financial implications for both the public and private assets and projects; **biologists** for ensuring that optimal agro-economics does not result in ecological devastation; **veterinarians** – for the purpose of proper breeding and breed specification, livestock need specification and identification of possible dangers, risks, and potentials in animal husbandry, care, and propagation; **architects** – for spatial need identification, design and creation of masterplans of the bespoke rural typologies, human and animal settlements as well as agro-industrial units; **engineers** – for soil and water analysis, irrigation-scheme design and water reticulation within the rural area, as well as **local authorities** for public mobilisation.

6.4.2 Periodic Farmers Markets Interventions for Resilient Rural-Urban Linkages in a Post-Pandemic Era

Rural resilience involves both risk reduction and economic protection, which includes access to amenities and financial resources after external shocks. These comprise climate-smart investments, drought-resistant technology, agricultural Architecture as well as input credit. Spatially, the following are the most notable planning solutions recommended for the study area in regard to periodic farmers markets.

6.4.2.1 Local Physical Land-Use Plan

The creation of a Local Physical Land-Use Plan for each of the market centres within the periodic farmers markets would ensure the sustainable utility of land, development control, a sustainable implementation framework, development feasibility, and also a substantial increase in land value. This is an opportunity that would be availed to the public for deliberation to allow for adequate provision of basic necessities within their local context.

6.4.2.2 Design for Periodic Markets Based on Needs Matrices

Site planning of each individual market would allow for the envisioning of each market as a stand-alone entity with sustainable properties to facilitate development. This would enhance the value and useability of each market for the optimisation of the intended purpose. This would include:

- Pedestrianizing streets within market centres for efficiency and ease of access
- Spatial design for human comfort, user-friendliness, and environmental consideration

- Envisioning room for expansion, possible growth, and the projection of both
- Design for public amenities, shared resources, and mixed-use functions
- Design for spatial consideration of special ergonomics as in the case of livestock and carts
- Planning for sustainable growth of the interconnected markets as a network of collective economic dependence and development based on the concept of periodicity

6.4.2.3 Machakos-Kitui Road Design for Efficiency; Animal Crossings and Pedestrian Walkways

Need arose from the study for the redesign of sections of the Machakos-Kitui highway to allow for crossings for pedestrians and animals, especially due to the periodic farmers market circuit. This is important as it helps reduce the mortality attributed to the lack of designated crossing sections for the aforementioned. Incidences stemming from this neglect result in astronomical economic loss, loss of livelihoods, destruction of property, and loss of human life as was earlier discussed. This will go a long way in ensuring that the users are protected from incoming traffic, as well as protecting motorists from run-away livestock, especially during early morning hours when most travel is done. The migration of people and animals forms the basis of periodic markets. And while the periodicity may not be eternal, the projected timeframe in which these periodic markets may be in existence will exceed the lifespan of the current generation. If history is any indication, periodic markets are not about to go out of style any time soon. Thus, planning for them during the design of roads is a necessity that need not be overlooked.

6.4.2.4 Regional Physical Land-Use Plan

The creation of a Regional Local Physical Land-Use Plan for the purpose of interlinked socio-economic dependence would be important. This allows for the regional appraisal of trade and economics based on the *Chaos Theory Concept*. It allows all relevant users to appreciate the various developments, albeit social, cultural, environmental, ecological, or economic, and their possible impacts on the various nodes within the region. This allows for more realistic projections for even the smallest alterations in conditions within the region and how this would result in trickle-down impacts to the direct and indirect planning vicinity. This connection expounds on the focus given to various nodes over others and how this translates to both the physical and economic planning arena. A Regional Physical Land-Use Plan would create a platform to assess the planning scope in a collective, more comprehensive manner for the benefit of the entire region.

6.4.2.5 Use of Technology – for Producers, Consumers, and Traders

With the current increase in online presence for the general public, the incorporation of technology in the markets was envisioned as a possible proposal. The use of technology, in form of websites and applications to help map out the commodities within the market, means of sourcing produce, and linkage

with farmers and consumers would create a platform for revolutionary change in the sector. Technological advancement can only get more intricate, negating it in an economic venture as vibrant and important as the food market may be considered in poor taste if not inconsiderate in this information age. This is important for the actualisation of socio-economic empowerment at various stages of the supply chain. These would help reduce the parasitic involvement of middlemen in the food and livestock trade for the benefit and efficient exchange for both producers and consumers.

6.5 Suggestions for Further Research

This study was an exploratory assessment of *‘Potential for Periodic Markets as Nodes of Food Trade and Territorial Development.’* It carries implications on food trade, livestock trade, spatial planning of periodic farmers markets, spatial planning for periodic farmers markets, land-use planning for market centres, economic planning for regional development, mapping of periodic farmers markets, mapping of food deserts, asset-mapping for periodic farmers markets, regional integration through transport planning as well institutional involvement in agro-economics and agro-industry. Based on the precedents alluded to within the proceedings of this study, a few areas considered needed further interrogation. Such would include:

- Appraising the Impacts of Transport Corridors on the food supply chain
- Potential for Land-Use planning for Mwala Sub-County for Socio-Economic Empowerment
- Preparation of a Local Physical and Land-Use Development Plan for Masii Township
- Preparation of a Local Physical and Land-Use Development Plan for Wamũnyũ market centre
- Preparation of a Local Physical and Land-Use Development Plan for Katangi market centre
- Preparation of a Local Physical and Land-Use Development Plan for Kĩthangathĩnĩ intersection
- Preparation of a Local Physical and Land-Use Development Plan for Makutano (Mwala) intersection and shopping centre
- Preparation of a Local Physical and Land-Use Development Plan for of Kaseve market centre

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APPENDICES

Appendix 1: Research Request Letter for Key Informants



Scms/WAS
Please assist
the bearer of
the letter to
gather information
J/K.

University of Nairobi
Department of Urban and Regional Planning
Faculty of the Built Environment and Design
P.O. Box 30197, 00100 GPO Nairobi, Kenya
e-mail: durp@uonbi.ac.ke

28th March, 2022

TO WHOM IT MAY CONCERN

RE: RESEARCH PROJECT – IGNATIUS MWANGI – B63/37991/2020

This is to confirm that Ignatius Mwangi, is a M.A (Planning Student) in the Department of Urban & Regional Planning, University of Nairobi.

As part of the Masters of Arts in Planning programme, the students are required to acquire training in data collection, analysis and report writing in the field of Urban and Regional Planning.

We wish to request you to allow Ignatius to access your Institution/Neighbourhood in order to collect data for his research project titled "*The potential of Periodic Markets as Nodes of Food Trade and Territorial Development along Machakos-Kitui road, Machakos County*".

Any assistance accorded to him will be highly appreciated.



DR. FRIDAH W. MUGO
CHAIR - DEPARTMENT OF URBAN & REGIONAL PLANNING

Appendix 2: Project Workplan

Timeframe	Stage	Scheduled Activity	Area of study
27 th Jan	Oral defence of project	Presentation of research proposal	ADD room 201
4 th – 5 th Feb	Pilot study	Site Reconnaissance, site familiarisation and selection	<ul style="list-style-type: none"> • Kaseve market centre, • Masii Township centre, • Wamũnyũ market centre, • Makutano market centre
		administration of interviews to select key informants,	
		use of observation checklist,	
		Sample size, and sampling technique determination	
8 th – 10 th April	Data collection	Administration of research instruments <ul style="list-style-type: none"> • Use of observation schedules • Use of interview schedules • Use of questionnaires • Filling in data collection checklist 	<ul style="list-style-type: none"> • Kaseve market centre, • Masii Township centre, • Wamũnyũ market centre, • Makutano market centre • Kĩthangathĩnĩ Market centre • Miondoni Market centre • Katangi Market centre
11 th – 14 th April	Data collection	Administration of research instruments <ul style="list-style-type: none"> • Use of observation schedules • Use of interview schedules • Use of questionnaires • Filling in data collection checklist • Conduction focus-group discussions 	<ul style="list-style-type: none"> • Masii Township centre, • Wamũnyũ market centre, • Katangi Market centre
14 th April - 24 th May	Desktop analysis	Data Analysis Consolidation of report	Desktop Analysis and report compilation
26 th May	Submission of findings	Submission of findings	Submission of findings
14 th June	Presentation of findings	Presentation	Presentation
22 nd June	Oral defence	Presentation	<ul style="list-style-type: none"> • Presentation • Submission of findings

Appendix 3: Community PRA (Participatory Rural Appraisal) Survey

University of Nairobi
 Faculty of the Built Environment
 Department of Urban and Regional Planning
 BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master’s Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this **community participatory rural appraisal** survey is confidential.

a. Social Status (number of respondents recorded)

Status Factor	Female Participants	Male Participants	Total Participants
Number of Participants			
Single household head			
Land holding			
- Houseplot only			
- Houseplot + < 0.5			
- Houseplot + > 0.5			
Household size			
- < 5 persons			
- average (5-6 persons)			
- > 6 persons			
Wealth indicators/ assets			
Water tank			
Motorcycle			
Bulls (for draught)			
Cows (for milk)			
Donkey			
Electricity			
Solar connectivity			
TV			
Radio			
Smartphone			

b. Production utilization of main crops (group opinion on % of total)

Products ranked in importance	Consumption %			Processed %	Sold at farm-gate/ in farm		Sold at market	
	Food	Seed	Animal feed		%	Kshs. / Kg	%	Kshs. / Kg
1. Maize (including maize flour)								
2. Beans								
3. Pigeon peas (nzuu)								
4. Cow peas (nthooko)								
5. Green grams (ndengu)								
6. Sorghum (múvya)								
7. Millet (mwele)								
8. Cabbage								
9. Kale (Sukuma-wiki)								
10. Potatoes (maluu)								
11. Plantains (matoke)								
12. Onions (kitúngúú)								
13. Snow peas (mbinzi)								
14. French beans (misanzi)								
15. other vegetables – -								
16. Fruits								
17. Beef								
18. Chicken								
19. Fish								
20. Milk								

c. Problem analysis of typical crops (group opinions recorded)

	Products						
	Grains and cereal	Fruit	Vegetables	Meats	Milk	Honey	Eggs
1. Storage							
- Home storage							
- Community storage							
- Pests							
- Prices and margins							
2. Marketing							
- Transport							
- Linkage with traders							
- Prices and margins							
3. Processing							
- Home processing							
- Mills and processing							
- Prices and margins							

Appendix 4: Household Food Marketing and Consumption Survey

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **household marketing and consumption survey** is confidential.

1. Date of Survey:
2. Location, sub-county:
3. Village name:
4. Gender of Farmer: () Female () Male () Intersex
5. Relationship to female head of household (e.g., self, mother, grandmother, etc.):

6. Family assets:

Land holding (acres)	size/ capacity of family homestead	Bicycle	Motorcycle	Dairy Cows	Bulls	Cart	Plough	Smartphones		Solar panels

7. Family size within homestead

	Female adults	Male adults	Intersex adults	Female children	Male children	Intersex children
Number						
Ages						

8. Animal products used for foodstuffs

	No. produced annually	Amount produced annually (kg)	Sold at farm-gate in kg (& number)	Sold in market in kg (& number)	Amount bought to eat annually in kg or number
Chicken					
Ducks/ geese					
Turkey					
Eggs					
Beef					
Goat meat					
Milk (and products)					
Lamb/ mutton					
Honey					
Fish					
Pork					

9. Production and consumption of arable produce:

	Total production in dry season (kg)	Total production in wet season (kg)	Total production (wet and dry season (kg)	Amount sold annually to traders collecting from farm-gate/ village (kg)	Amount sold annually by farmer at market or trader at market (kg)	Retained annually for seed	Amount bought annually (kg)	Amount eaten daily in dry season (kg)	Amount eaten daily in wet season (kg)
Maize (including maize flour)									
Rice									
Beans									
Pigeon peas (nzuu)									
Cow peas (nthooko)									
Green grams (ndengu)									
Sorghum (múvya)									
Millet (mwele)									
Cabbage									
Kale (Sukuma-wiki)									
Potatoes (maluu)									
Plantains (matoke)									
Bulb Onions (kitúngúú)									
Snow peas (mbinzi)									
French beans (misanzī)									
other vegetables (specify)									
Fruits									

Appendix 5: Analysis of Production Sales and Consumption

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this **production sales and consumption survey** is confidential.

1. Date of Survey:

.....
.....

2. Village name, Location, sub-county:

.....

3. Average family size of farmers interviewed:

.....

	Summary of production and sales				Summary of consumption		
	Total production (wet and dry seasons)	Total sold surplus at farm-gate/ village and/or market	Total sold surplus as a % of total production	Average amount bought annually in (kg)	Average amount eaten daily by the family (kg)	Total amount eaten annually by the family (kg)	Amount eaten annually per capita (kg)
Maize (including maize flour)							
Rice							
Beans							
Pigeon peas (nzuu)							
Cow peas (nthooko)							
Green grams (ndengu)							
Sorghum (múvya)							
Millet (mwele)							
Total grains/pulses							
Cabbage							
Kale (Sukuma-							

wiki)							
Potatoes (maluu)							
Plantains (matoke)							
Onions (kitúngúú)							
Snow peas (mbinzi)							
French beans (misanzi)							
other vegetables (specify)							
Total vegetables							
Mango							
Bananas							
Other							
Total Fruits							
Chicken							
Ducks/ geese							
Turkey							
Beef							
Goat meat							
Lamb/ mutton							
Honey							
Fish							
Pork							
Total meat							
GRAND TOTAL							

Appendix 6: Checklist for Preparing Preliminary Market Inventory

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this **market inventory** is confidential.

For each significant market in the area (whereby more than 10no. farmers or traders' stalls handling agricultural produce) the following information should be collected:

Market Identification	Name and exact location on Base-map	
Responsible agencies	Agency/ agencies (e.g., local government, private body, co-operative) responsible for market management	
Frequency of operation	Whether the market opens daily, twice a week, once a week, etc. (record days mentioned)	
Catchment area of market	Names of villages served and their total population	
	Names of villages or areas sending produce to the markets	
Level of trade on peak day	Number of permanent retail stallholders (selling fresh produce)	
	Number of farmers visiting the market to sell produce	
	Number of wholesalers, collector or assemblers purchasing at the market	
Physical facilities	Total area of market (square metres or hectares)	
	Total number of fixed stalls by function (fish, meat, fruit, vegetables, charcoal, firewood, medicinal plants, etc.)	
	List of key facilities (roads and parking, water supply, toilets, refuse disposal, maize mills, extension office, etc.)	

Appendix 7: Estimating the Throughput of Markets and Shops

(Note: one form is used for each facility and each row in the form is to be used for a single set of observation)

1. Reference code for vendor (village/no.):
2. Building type: Shop/ supermarket/ market stall:
3. Date/ time of survey:
4. Name of Surveyor:

Code	Commodities sold	Farm of origin	Vegetables	Fruits	Root crops	Animal products	Unit	Weight	Total weight
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

Appendix 8: Mapping of Food Markets and Shops

(Note: each row in the form is to be used for a single set of observations of a single facility)

1. Reference code (village/code.):

.....

2. Base map code:

.....

.....

2. Name of Urban/ Market centre:

.....

3. Date/ time of survey:

.....

4. Name of Surveyor:

.....

Code	Ward no.	Ward name	Type of sales area					Commodities sold (record volume sold per day/ week if possible)								Area (m ²)	Notes
			Fixed shop	Super-market	Stall roofed	Stall lockable	Open space	Fruit only	Veg. only	Fruits and veg.	Fish only	Meat only	Poultry only	Meat and poultry	Mixed foods		
1																	
2																	
3																	
4																	
5																	
N th																	

Appendix 9: Interview Survey with Marketing Functionaries

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master’s Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **enterprise survey** is confidential.

1. Market functionary’s address/ location in the market (mark location of stall and stall reference number on site plan)
2. Day of the week/ date:
3. Name of interviewer:
4. What type of trade do you undertake and type of stall do you operate? (Open, roofed, enclosed/ lockable + total area in m², etc.)
Wholesale, retail or blended?
5. What type of products do you trade on a typical day? (List type, the weight in kg and average price per kg. of unit)

Commodity	Weight in kg	Price per unit	Price per kg
1			
2			
3			
4			
5			
6			
7			

6. How does this vary with the season? (% increase or decrease in volume/ weight of produce)

Season	Wet Season	Dry Season
Increase (%)		
Decrease (%)		

7. Which days do you come to the market?
 - a) What are the peak market days?
 - b) Do you frequent other markets?
 - c) Name market and state market days:

8. Do you own your stall?
- a) If yes, how much did you pay to build your stall?
9. Did you lease your stall?
- a) If yes, what is the duration of lease? (month/ year)
- b) How much did you pay to lease or purchase your stall?
10. How much do you pay each day/ week/ month to the market owner (local authority responsible)?

Expenditure	Cost
Security per day/ week/ month	
Cleaning/ waste disposal per day/ week/ month	
Other fees per day/ week/ month	
Total expenditure	

11. How much do you spend on repairs/ miscellaneous (other) costs per month?
12. Where do your products come from in the **wet** season? (From which general region, if possible, indicate percentage)

Product	Percentage
	%
	%

13. Where do your products come from in the **dry** season? (From which general region, if possible, indicate percentage)

Product	Percentage
	%
	%

14. Kindly account the types of people that you purchase goods from. If possible, give an average percentage

Source	Percentage
Farmer	%
Transporter (at/by the vehicle)	%
Trader	%
Middlemen	%
Other market (kindly name them)	

15. Do you know where most of you customers come from? (From which general region, if possible, indicate percentage)

Village/ Region/ area	Percentage
	%
	%

16. Do you have any other active businesses other than the one in the market?
If yes, kindly list what they are and where they are located;

.....

Type of economic activity	Location

17. Do you use your own **means of transport**? (e.g., vehicle, motorcycle)
- a) If so, what kind is it?
 - b) Is it self-owned or is it hired?
 - c) What is the total load that this means of transport can carry?
.....
 - d) Do you also use the vehicle for marketing produce? (Collecting from farmers or delivering produce to customers)
 - e) Do you market any of your own produce?

18. Are the prices paid for produce at the market less or more than in other main markets?

.....
Kindly estimate a percentage, by how much is the price more or less.
.....

Product	Percentage
	%
	%

19. Are sales prices at the market less or more than in the producing area markets?

.....
Kindly estimate a percentage, by how much is the price more or less.
.....

Product	Percentage
	%
	%

20. Do you employ any staff?

- a) If so, how many?

21. Do you any linkage with other areas or groups? (e.g., ;)

Family linkage – using family farm	
Credit from bank/ microfinance	
NGO, CBO, FBO	
Any other linkages (kindly specify)	

Appendix 10: Consumer Survey

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **consumer survey** is confidential .

1. Survey location: _____
 1. Enumerator's name: _____
 2. Date of survey: _____
2. Interviewee' home village and gender: _____
3. What is the size of your family or household: _____ ?
4. Do you grow any food at home? _____
 1. What portion does your family consume? _____
 2. What portion of your root crops (e.g., potatoes, cassava) do you buy from the various outlets: _____ ?

	Never	Not often	Average	Often	Very often
Market					
Supermarket					
Local shop/ kiosk/ kibanda					
Other (kindly specify)					

3. What portion of your vegetables (e.g., tomatoes, carrots, cabbage) do you buy from the various outlets: _____ ?

	Never	Not often	Average	Often	Very often
Market					
Supermarket					
Local shop/ kiosk/ kibanda					
Other (kindly specify)					

4. What portion of your fruit (e.g., mango, bananas) do you buy from the various outlets: _____ ?

	Never	Not often	Average	Often	Very often
Market					
Supermarket					
Local shop/ kiosk/					

kibanda					
Other (kindly specify)					

5. What portion of your meat (e.g., beef, chicken, fish) do you buy from the various outlets:
_____?

Market	
Supermarket	
Local shop/ kiosk/ kibanda	
Other (kindly specify)	

6. What type of transport do you use when visiting the market? (Private car, taxi, tuk-tuk, etc.)

7. If you drive, or are driven, do you park your private car at the market?

yes () no ()

8. Do you also make other trips around the centre when you go to the market?

yes () no ()

9. If so, kindly list a few secondary activities you do in the centre. (e.g., banking, leisure trip to restaurants, education, etc.) _____

The survey is to indicate that the information provided is strictly confidential and for use in academia. And that the participants are not to share their private information or contact detail, which will not be requires for the study.

Appendix 11: Transportation Survey – Boda-Boda Operators

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master’s Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **transportation survey** is confidential.

1. Survey location: _____
2. Enumerator’s name: _____
3. Date of survey: _____
4. Interviewee’ home village and gender: _____
5. Which route do you use (which markets do you use as a stage?) _____
6. What do you carry? Passengers () luggage () food ()
7. Do market days affect business? _____
If so, how? _____

8. Which days have more people/ business/ traffic? _____
9. How many trips do you make per day during **markets** days? _____
10. How many trips do you make per day during **non-markets** days? -

11. What are the levies charged to boda-boda operators? (e.g., parking fees, licenses, insurance)

12. How is the security situation in the market for boda-boda operators? _____

13. How is the security situation along the routes used for boda-boda operators? _____

Appendix 12: Transportation Survey – Lorry Operators

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master’s Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **transportation survey** is confidential.

1. Survey location: _____
2. Enumerator’s name: _____
3. Date of survey: _____
4. Interviewee’ home village and gender: _____
5. What products do you trade in? (What do you sell?) _____
6. Where do you source (get) your products from? _____
7. Do you purchase your goods: in farms () at collection centres () in market ()
8. Do you sell on: **retail** () **wholesale** ()
9. Which are your main markets of trade? (Indicate if they are retail or wholesale markets)

10. What do you carry?

Fruits	Vegetables	Live animals	meat	Eggs	Animal feed	Charcoal	fertilizer	Other (specify)

11. How do planned market days affect business? _____
12. Which markets do you visit per week? _____
13. What makes you prefer some markets over others? _____
14. What are the rates paid to the county by lorries in markets? _____
15. How is the security situation in the market for large-scale operators? _____
16. How is the security situation along the routes used for large-scale operators? _____

Appendix 13: Veterinary Department – Mwala Sub-County Office – Masii Township

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master’s Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory survey is confidential.

1. What are the conditions of veterinary services in Mwala sub-county?
2. How do people usually access veterinary services in Mwala sub-county?
3. What strategies have been put to ensure wider reach of veterinary services in Mwala sub-county?
4. How do you deal with pest and diseases among livestock?
 - a. In homesteads
 - b. In the market centres
 - c. At the abattoirs
5. How do you offer sensitization and information dissemination on livestock health to farmers?
6. Does your department keep data on issues facing livestock in Mwala sub-county?
7. Does the county have an action plan for the agricultural sector, specifically for the livestock department?
8. What animals are kept in Mwala sub-county?
9. Is there a breeding catalogue available to farmers? (For bovines, goats, pigs, poultry, etc.)
10. Where is the genetic material sourced from?
11. How is bee-keeping perceived and/ or practiced in Mwala sub-county?
12. Is there a catalogue of bee-keepers in the county?
13. How are the apiary activities regulated?
14. Are there sensitization efforts for better livestock husbandry in Mwala sub-county?
15. What are the challenges faced by the department of Livestock?
16. How did COVID-19 affect the department?
17. How did the department mitigate against the effects of COVID-19?
18. What would you propose to enhance effective delivery from the department?
19. How can physical planning influence the delivery of the department of Livestock?

Appendix 14: Forest Department

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory survey is confidential.

1. What is the organizational structure of the department?
 - a. Comment on the existing capacity? (Human, financial, equipment)
2. What major forest-oriented agricultural activities are there in the region?
3. In which areas do the mentioned activities take place? (Indicate in the map)
 - a. How many forests are there in Mwala sub-county?
 - b. How are the reforestation and afforestation efforts?
4. What is the scope of the forest department? How many people does it serve in a year?
5. What are the annual production trends for tree seedlings in the last five years in the planning area?
6. Do you have the statistical data on the number of farmers in the various production sectors identified above?
7. What production and management challenges does the forestry sector face?
8. What measures have/can be put in place to solve the mentioned challenges?
9. What is the influence of Masii market and the periodic markets on the forest department?
10. How is sensitization done on the importance of forestry to the public?
11. How has climate change impacted the forestry sector in Mwala sub-county?
12. Did COVID-19 impact the forestry sector? If so, kindly elaborate.
13. What were the measures taken to enhance efficiency during the COVID-19 period?
14. What are the projections of forestry production in terms of seedling production and forest propagation?
15. What are the challenges facing the forestry sector?
16. How can physical planning influence the growth of the forestry sector in the region?

Appendix 15: Agriculture Extension Office and Cooperative Societies

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this **participatory survey** is confidential.

1. What is the organizational structure of the department?
 - a. Comment on the existing capacity? (Human, financial, equipment)
2. What are the main agricultural activities in the area?
3. In which areas do the mentioned activities take place? (Indicate in the map)
4. What are the annual production trends for the last five years in the planning area?
5. Do you have the statistical data on the number of farmers in the various production sectors identified above?
6. What production and management challenges does the agricultural sector face?
7. What measures have/can been put in place to solve the mentioned challenges?
8. Did COVID-19 impact the agricultural sector? If so, kindly elaborate.
9. What were the measures taken to enhance efficiency during the COVID-19 period?
10. What are the projections of agricultural production?
11. What are the challenges facing the agricultural sector?
12. How can physical planning influence the growth of agriculture in the region?

Cooperatives

1. How many active cooperative societies are within the planning area?

Registered cooperatives	Number	Name and Activities
Active		
Dormant		

2. What challenges do the cooperatives face? _____

3. What can be done to solve the challenges/Issues?

4. Did COVID-19 affect the cooperatives.

If so, kindly elaborate. _____

Appendix 16: Physical Planning Department

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory survey is confidential.

1. What is the organizational structure of the department?
 - a) Comment on the existing capacity? (Human, financial, equipment)
2. Is there an existing plan for Mwala sub-county?
3. What aspects of the existing Plan have been implemented?
4. How are market centres factored in during the planning?
5. How successful has the implementation of the plan been?
6. What factors have hindered effective implementation of the Plan as per the implementation schedule?
7. What are the challenges the department is currently facing?
8. How does the Planning department go about planning for the agricultural areas?
9. Are there sectoral plans for the sector?
10. What is the influence of the market centres on the development of adjacent land?
11. How is development of the market centres regulated?
12. What is the influence of Machakos-Kitui road on the market centres along it within Machakos County?
13. Have there been issues with regard to implementation of development control guidelines?
14. What proposals could be made by the department to enhance the economic capacity of market centres in rural areas and sustainable growth of the resultant towns?

Appendix 17: Focus Group Discussions

University of Nairobi
Faculty of the Built Environment
Department of Urban and Regional Planning
BUR 604: Research Project II

Date.....

Study Area: _____ Market centre, Machakos County

Title of Master's Research Project: The Potential for Periodic Markets as Nodes of Food Trade and Territorial Development

Declaration: This research is being carried out purely for academic purposes. All information provided for the purpose of this participatory **focus group discussion** is confidential.

GENERAL INFORMATION

1. What is the scale of agriculture practiced? On what size of farm?
2. What are the kinds of agricultural practised in the sub-location?
3. How much space is given per agricultural practice?
4. What is the reason for the given allocation?
5. Do you work on the farm year-round, seasonally, or occasionally? Describe the agricultural practices undertaken, the time designation and productivity.

FOOD CROPS

1. Which food crops are grown in the sub-location?
2. When are they grown? And why that particular time?
3. Rank food crops in order of importance and preference by the community
4. What is the production level of the current food crops in the village – average yields per acre
5. What are the optimal production levels?
6. How are food crops marketed in the sub-location?
7. What is the unit selling price of current food crops in the sub-location?
8. What are the challenges facing food production in the sub-location?
9. How has climate change affected the food production in the sub-location?
10. How did COVID-19 impact the food production in the sub-location?
11. What can be done to improve food production within the sub-location?

LIVESTOCK SECTOR

12. What livestock enterprises are reared in the sub-location?
13. What are the main outputs of livestock husbandry in the sub-location?
14. Rank livestock enterprises in order of importance.
15. Which livestock enterprises identified (and in what numbers) would be ideal to sufficiently support an average household economically for a whole year? E.g., how many dairy cows, bulls, donkeys, birds per household can be considered sustainable?
16. What is the source of animal feeds?
17. How are the livestock enterprises sustained during various seasons (wet and dry)?
18. How are the livestock enterprises and livestock products marketed in the sub-location?
19. What is the unit selling price of current food crops in the sub-location?

20. What are the challenges facing livestock enterprises and production in the sub-location?
21. What are the main challenges of processing products from livestock enterprise in the sub-location?
22. What efforts have farmers attempted to mitigate challenges experienced in the processing of products from livestock enterprise in the sub-location?
23. What would you propose to enhance livestock enterprise in the sub-location?

FOREST SECTOR

24. What type of forest products are produced in the sub-location?
25. Are they from on-farm natural or on-farm planted?
26. Which dominant species are planted?
27. Which indigenous species are dominant?
28. What are the products obtained from named trees?
29. Is there an order of preference? If so, kindly elaborate.
30. Are there planting patterns in the sub-location? If so, kindly describe them.
31. What are the uses for forest products in the sub-location?
32. What is the profitability of forest products? Give examples
33. What is the source of tree products in the sub-location?
34. How are they propagated? Is there a seasonal preference to tree planting?
35. What is the source of tree seedlings?
36. What is the trend in tree propagation in the sub-location?

TRADE AND COMMERCE

37. What products are brought into the sub-location from other places?
38. Where do they come from? County?
39. What additional products are demanded and can be brought in from other places? Which ones and from where?
40. What products from the sub-location are sold elsewhere? Where are they sold?
41. What other products from the sub-location can be sold elsewhere?
42. What needs to be done to enhance trade in the sub-location?

MARKETS

43. In which markets do you trade?
44. How do market days affect trade in the ward?
45. What is the hierarchy of markets for people in the ward? Where do you get what products?
46. What is the main challenge of markets in the ward?
47. How does the periodic markets system impact trade in the ward?
48. Are the markets accessible?
49. How efficient is the hierarchy of markets?
50. What are the challenges faced when participating in the as a trader? As a consumer?
51. How did COVID-19 affect use of the market? Access to market centres?
52. Does the location of the markets affect access? If so, how?
53. How is the transport route towards the markets? Does it affect how often you visit the market?
54. Other than for trade and purchase of goods, are there other services you seek in the market centres? If so, which ones?
55. What would you propose to enhance the experience at the market? The market centres?