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Geographisches Institut, Humboldt-Universität zu Berlin

Elmar Kulke, Christian Sonntag (eds.)

“Science meets Business – Logistics and Retail of Fresh Fruit and Vegetables in Kenya and Tanzania” - Proceedings of the Workshop in Nairobi (October 2018)

Heft 198 **Berlin 2020**

Cover photo: Muthurwa Market in Nairobi (Christian Sonntag 2017)

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Prologue and Greetings

We would like to thank all participants at the successful workshop "Science meets Business – Logistics and Retail of Fresh Fruit and Vegetables in Kenya and Tanzania". The two-day workshop was held in Nairobi on October 11th – 12th, 2018.

This exciting and productive workshop was part of the German Research Foundation (DFG) funded research project "How do fresh fruit and vegetables (FFV) get to supermarkets in Kenya and Tanzania? The interrelations between the expansion of supermarkets and the establishment of delivery systems/intermediaries for fresh products." The project is carried out at the Department of Geography (Economic Geography) of the Humboldt-Universität zu Berlin.

The aim of the workshop was to share knowledge and information gained from research projects with the knowledge of the various practitioners involved. Together all participants discussed latest scientific insights from researchers and practical inputs from involved actors/stakeholders like retailers, producers, intermediaries, governmental institutions and NGOs.

Bringing together different actors within the agricultual value chain might help facing the challenges within retail and logistics of fresh fruit and vegetables in Kenya and Tanzania.

In the first part of the workshop scientists and actors involved followed by discussions presented various inputs concerning the agricultural value chain. In the second part of the workshop “Round Table discussions” helped to identify potentials and constraints of the fresh product supply to supermarkets.

We hope the lectures and discussions were inspiring and helpful for all participants.

Kind regards.

Prof. Dr. Elmar Kulke, Christian Sonntag
Department of Geography
Economic Geography
Humboldt-Universität zu Berlin

Participants

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Anne-Sophie Kagel	Humboldt-Universität zu Berlin
Arne Rieber	Freie Universität Berlin
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Benson Nyaga	Karatina University
Boniface Wambua	University of Nairobi
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Parita Shah	University of Nairobi
Patrick Nzioka Onzere	Kabete Organic Gardens
Peterson Mwaniki	Luifarms
Elmar Kulke	Humboldt-Universität zu Berlin
Gilbert Nduru	Karatina University
Salome Kaniu	Fig Tree Market
Samuel Owuor	University of Nairobi
Stella Nyagah	Agriterra

Stellah Mukhovi	University of Nairobi
Wambui Mbarire	RETRAK Retail Trade Association of Kenya
Watila Wanyonyi	Frontier Consulting
Yasin Juma	Fundissa Cottage

Photo: “Science meets Business” Meeting in Nairobi, October 2018 (KAGEL 2018)

Timetable – "Science meets Business – Logistics and Retail of Fresh Fruit and Vegetables in Kenya and Tanzania"

Thursday, 11th October 2018

08.00 a.m. – *Registration*
09.30 a.m. – *Opening by Ephraim Wahome (University of Nairobi), Gilbert Nduru (Karatina University), Elmar Kulke (Humboldt-Universität zu Berlin)*
09.45 a.m. – **What are the Emerging Research Concerns in the Organization and Management of Fresh Fruit and Vegetable Value Chains in Kenya?** by Gilbert Nduru (Karatina University)
10.15 a.m. – **The Urban Food System of Nairobi** by Samuel Owuor (University of Narobi)
10.45 a.m. – *Coffee Break*
11.00 a.m. – **Expansion of Supermarkets and Establishment of Delivery Systems/Intermediaries for Fresh Fruit and Vegetables in Kenya and Tanzania** by Christian Sonntag (Humboldt-Universität zu Berlin)
11.30 a.m. – **RETRAK - Experiences in Regard to Fresh Fruit and Vegetables in Supermarkets** by Wambui Mbarire (RETRAK)
12.00 p.m. – **Logistics and Supply Actors of Fresh Fruits and Vegetables to Supermarkets and Green Grocer**s by Maina Karuiru (Food Quality and Safety Services)
12.30 p.m. – *Lunch Break*
01.30 p.m. – **Application for Logistics of Fresh Fruits and Vegetables** by Beatriz Meijide (Agribusiness Club Forum)
02.00 p.m. – **Blind in Plain Data-Sight: Using Data to Grow the Value Chain** by Watila Wanyonyi (Frontier Consulting)
02.30 p.m. – **Food Production and Market Channels: Case of Machakos County, Kenya** by Parita Shah (University of Nairobi)
03.00 p.m. – *Coffee Break*
03.15 p.m. – **Value chain concept of GIZ and practical examples from Kenya** by Dominik Fortenbacher (GIZ Kenya)
03.45 p.m. – **Marketing and Business Strategies in Smallholder Agriculture in Embu County** by Arne Rieber (Freie Universität Berlin) & Benson Nyaga (Karatina University)
04.15 p.m. – **Delivering Vegetables and Herbs to Supermarkets** by Patrick Nzioka Onzere (Kabete Organic Gardens)
04.45 p.m. – *Closing Remarks*

Friday, 12th October 2018

09.00 a.m. – **Retail of Fruits and Vegetables in Machakos County, Metropolitan Region of Nairobi City, Kenya** by Alice Oluoko-Odingo (UoN)
09.30 a.m. – **Millions in the Kenyan Soil** by Jacquiline Mutheu (Luifarm)
10.00 a.m. – *Coffee Break*
10.15 a.m. – **Social-Ecological Resilience of Agro-Industrial Food System in Mount Kenya Region** by Stellah Mukhovi (UoN)
10.45 a.m. – **Socio-Ecological Dimensions of Fresh Fruit and Vegetable Supply on the Eastern and South-Western Slopes of Mount Kenya** by Geoffrey Wambugu (Karatina U.)
11.15 a.m. – *Coffee Break*
11.30 a.m. – **What are potentials and constraints in the fresh produce supply to supermarkets?** As Round Table Discussion
01.00 p.m. – *Lunch Break*
02.00 p.m. – **Presentation of Round Table Discussions**
05.15. p.m. – *Closing Remarks and Outlook*

Using a Socio-Ecological Model to Understand Fresh Fruit and Vegetables Supply Dynamics on the Windward Slopes of Mount Kenya

MWANGI WAMBUGU / ESTHER MAINA / GILBERT NDURU

We used a Socio-Ecological Framework to analyse the interrelationships between the state of resources, resource users, public infrastructure providers, public infrastructure and their implications on fresh fruit and vegetable supply in Karatina and Kathateni sub locations in Nyeri and Meru Counties, Kenya, respectively. The Framework proposed by ANDERIES et al. (2004) was used to analyse the robustness of socio-ecological systems (SES) attributed to the supply of fresh fruit and vegetables in Karatina and Kathateni in terms of: (a) the strength and weaknesses within the systems, (b) the potential opportunities, (c) the potential constraints and (d) the state of environmental resources in the face of Climate Change. Household data was collected qualitatively from 20 and 18 households in Karatina and Kathateni respectively. Results show that; despite decreasing farm sizes, fruit and vegetable production is relatively stable due to abundant rainfall, but there are major weaknesses in the supply chain attributed to the state of infrastructure especially in Karatina. The presence of a university and a construction company have diversified income sources and market for vegetables and fruits in Karatina and Kathateni respectively, but have put a strain on the state of infrastructure. There exists ready market for both fruit and vegetables, with the bulk of the produce sold directly to the green grocers and open air markets while a few farmers supply directly to supermarkets. There are major environmental constraints in both Karatina and Kathateni, including crop invasion by wildlife, declining quantity and quality of water in the rivers, changing climate (rainfall more erratic and unpredictable), frequent disease outbreaks and frequent pest outbreaks. To make the systems more effective, we propose the strengthening of the linkage between public infrastructure providers and the resource users through active participation by the resource users in decision making processes and financial monitoring.

Key Words: *Socio-Ecological Model, Infrastructure, Fruit and Vegetable, Climate Change, Karatina, Kathateni*

Introduction

The supply of fresh fruit and vegetables in rural places is an important to the state of health in a pupulation, with significant social and health inequalities attributable to areas that have poor access to such commodities (CASPI et al. 2012; FENG et al. 2010; FROST et al. 2010). Numerous studies have shown that adequate supply of fresh fruit and vegetables is critical in provision of good nutrition to human populations (BURNS et al. 2011; BUYS & LOCHER 2015; HUNG et al. 2015; LEE & FRONGILLO 2001; SAHYOUN & BASIOTIS 2001; SHARKEY et al. 2010; WOLFE et al. 2003; WOLFE et al. 1996, 1998). However, few studies have been conducted to show the linkage between the supply of fresh fruit and vegetables-and their implications to the dietary contents of rural populations- and the status of environmental resources. This study hypothesis that the availability of fresh fruit and vegetables, and their accessibility is intricately linked not only to the material, social, and spatial aspects of place (ANDRESS 2017), but also to the integrity of environmental resources of the place in question. These linkages can be better understood by application of theories that unite the concept of "place" as both a geographic and social parameter (GALSTER 2012; HANDY et al. 2002; MARMOT & BELL 2009; PUTRIK et al. 2014; YEN & SYME 1999). Places-defined as where we live, work and play-are at the forefront of the social determinants (KAWACHI & BERKMAN 2003; KRIEGER et al. 2003; LARSON et al. 2009).

Numerous theories have been proposed in the fields of geography and anthropology that attempt to explain the social construction of place where human experience becomes embodied in material and spatial forms (LOW 1996, 2003). Researchers are using these theories to explain the social configuration of "place" to the complex social, economic, and political factors that result in material inequities that can exist between places (HEYNEN et al. 2006). Places incorporate aspects of the built and natural environment (NORTHRIDGE et al. 2003), where the latter encopmasses any component in the physical environment that has been made by humans (roads, buildings, housing, infrastructure, and parks); while the former describes any part of the physical environment that is not created or modified by humans (NORTHRIDGE et al. 2003).

In this paper, we apply a socio-ecological framework adapted from ANDERIES et al. (2004) to better undertstand the type, nature and configuration of pathways that affect the supply of fresh fruit and vegetable supply in Mount Kenya region. This framework

attempts to identify several aspects of socio-ecological systems that make it robust. These include the institutional arrangements as well as the underlying ecological system. This framework is shown in Figure 1 below:

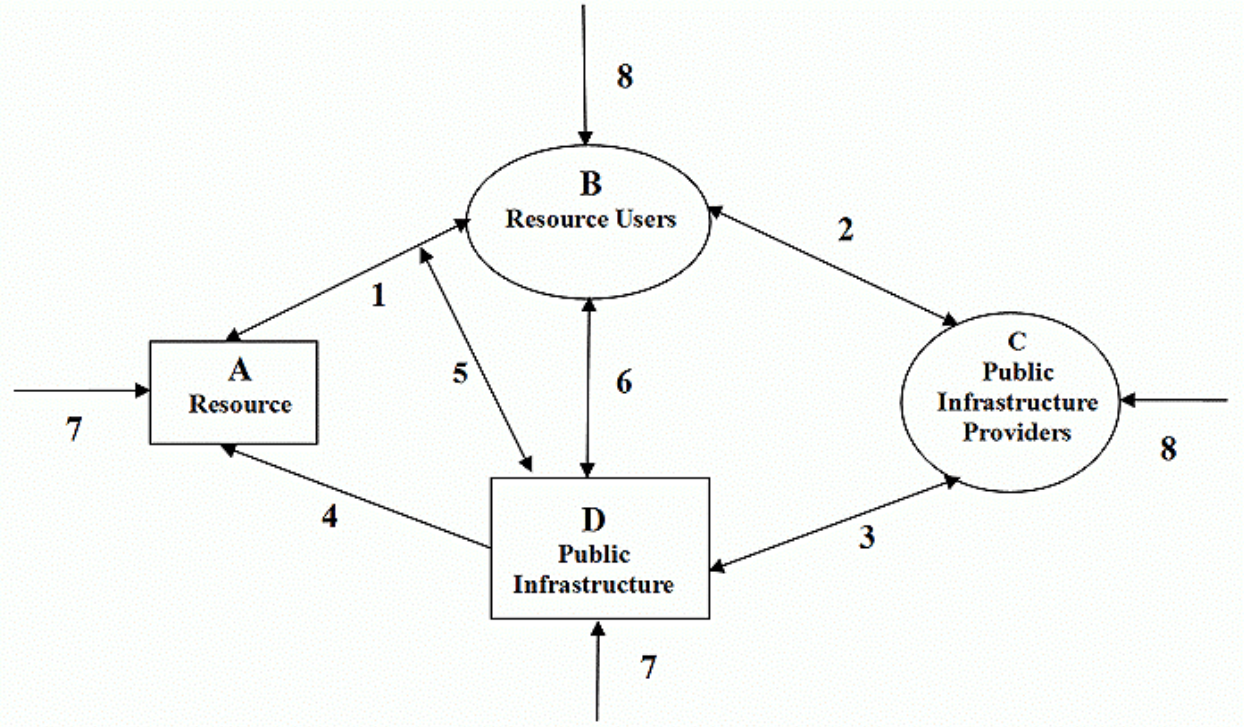

Figure 1: A conceptual model of a social-ecological system as proposed by Anderies et al. (2004). The robustness of a SES is dependent on the status of pathways that link institutions (resources, resource users, public infrastructure providers and public infrastructure). Examples of each of the links shown are (1) Availability of water when needed, (2) Recommending policies, (3) Building initial structure or ensuring regular maintenance, (4) Impact of infrastructure on the resource level, (5) Impact of infrastructure on the feedback structure of the resource harvest dynamics, (6) Coproduction of infrastructure itself, maintenance of works, monitoring and sanctioning, (7) Severe weather, earthquake, landslide, new roads, (8) Major changes in political system, migration, commodity prices, and regulation. (adapted from ANDERIES et al. 2004)

Methods

Study Sites

Kathatene Sub-location is located in Meru County in Kenya, while Gatei Sub-location is located in Nyeri County. The two sites are located on the windward slopes of Mount Kenya, the highest mountain in Kenya and the second highest in Africa at an elevation of 5,199m above sea level. Kathatene is located in approximately 225 kilometers north-east of Nairobi and on north-east slopes of Mount Kenya, at an altitude of 1,688m above sea level. Gatei is located about 127 kilometers north of Nairobi on the southern slopes of Mount Kenya. It lies at an altitude of 1939m above sea level.

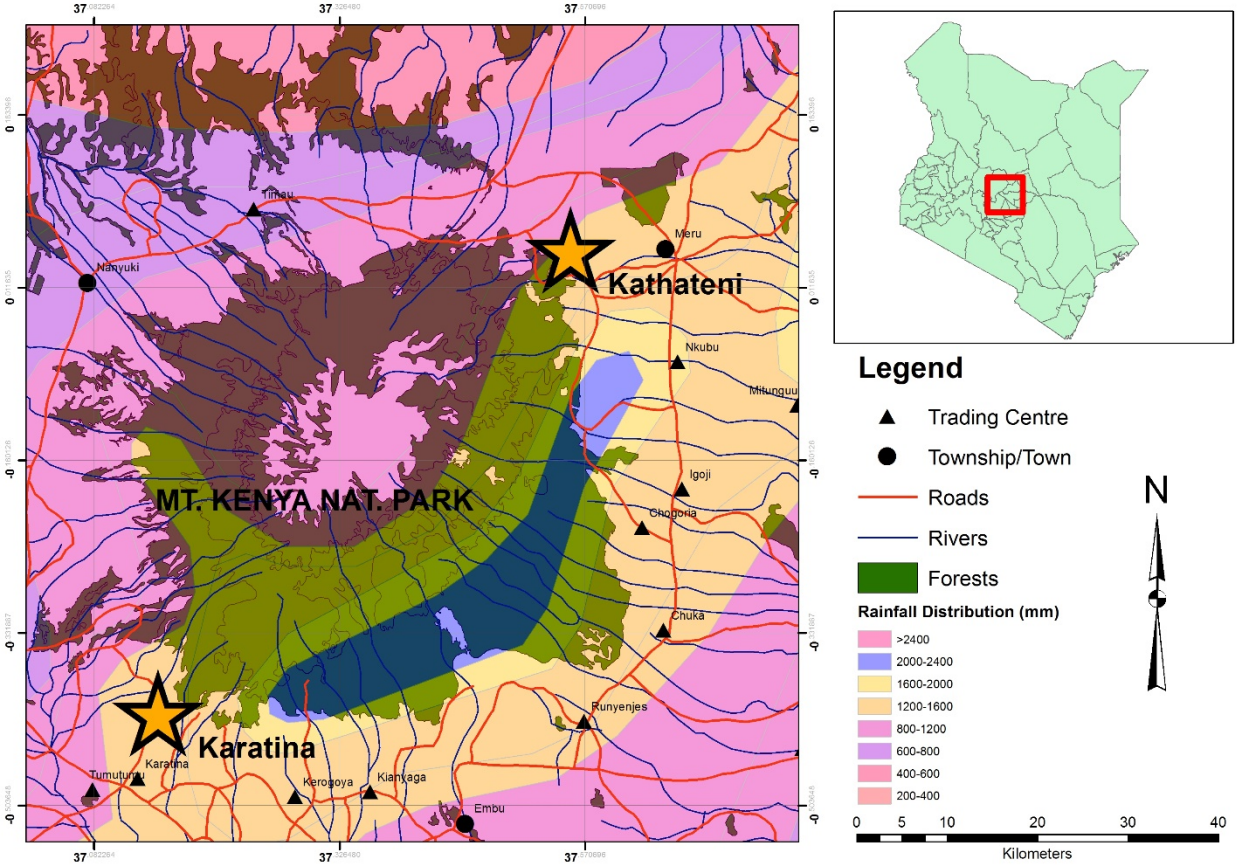

Figure 2: Map of the study sites (own research)

Geology and Soils

Both Karatina and Kathateni have fertile red volcanic soils defined by the location of the areas on the slopes of Mount Kenya (BAKER 1967). They are therefore ideal for fresh fruit and vegetable supply. Besides fruit and vegetable, Karatina is renowned for high production of tea which is mainly grown for export. Other crops produced in Karatina include maize, beans and potatoes. Livestock reared include dairy cattle, pigs and poultry (KENYA INFORMATION GUIDE 2015).

In Kathateni, agriculture dominates as the main economic activity, with the sector accounting for 80% of the area's income and 90% of the population directly or indirectly dependent on agriculture for their livelihood (OXFORD BUSINESS GROUP 2014). According to World Bank, despite the rapid urbanization in Kenya, Meru's rural population still exceeds 80%. Most people engage in subsistence farming where they grow crops such as maize, beans, sorghum, millet, cabbages and fruits. While most of the land is used for crop farming, there is also some livestock rearing in some of the areas for animals such as cattle, goats, sheep, pigs, poultry and some rabbits. Meru is also renowned for wide scale growing of khat commonly referred to as miraa, a herbal plant which has turned into a lucrative cash crop earning the locals millions of money from the export market as it fetches up to Ksh.1000 per Kg. The agricultural landscape consists of mainly smallholder farms. 98.6% of farms are small scale, not unusual for Kenya or indeed African agricultural markets in general (MOA MERU COUNTY PROFILE 2013). The national average farm size is two acres, but size varies according to population density where more sparsely populated areas see farm sizes up to five acres while densely populated areas have farms averaging one acre. Land redistribution and subsequent sub-divisions following independence have resulted in land holdings of less than one hectare as the norm (MCCORD et al. 2015).

Rainfall

The rainfall regime is bimodal in both Karatina and Kathateni, with long rains between March and May, while the short rains occur in the months of October through December (BÖHME et al. 2016). Average rainfall in Meru ranges between 500-1500 mm per year while in Karatina it ranges between 500mm-2600mm annually making both areas conducive for agricultural activities. Temperature ranges between 16^{o}C during the cold season and 23^{o}C during the warm season in Meru while in Karatina temperatures range between 12^{o}C during the cold season and 27^{o}C during the warm season.

Demographics

The human population in Meru County was 1,356,301 in an area of 6,933 square kilometers translating to a density of 195.63 persons per square kilometer (NATIONAL BUREAU OF STATISTICS 2013). Females were 685,645 accounting for 50.6% while males were 670,656 accounting for 49.4%. Nyeri County had a population of 693,358 in an area of 3,337 square kilometers translating to a density of 207.83 persons per square kilometer. Females were 353,834 accounting for 51% while males were 339,724 accounting for 49%.

Study Design

Data was collected in two phases. Phase one was conducted between 11th to 15th December 2017, and involved a preliminary study which included literature review, initial sites visits, a participatory and interactive discussions with the community key leaders and local residents of the study areas mainly for the purpose of familiarization with the areas, get insights on the research problem and identify likely population elements to be selected for the interviews. Phase two involved actual interviews and observations, and was conducted from 8th-23rd March, 2018. Interview guides were used to obtain data on different variables with regard to various aspects of the study. The interviews were conducted through farm visits on 55 respondents. The formulated questions of interest were open-ended to enable the respondents remain anonymous and honest in their responses as well as elicit more extensive discussions on some of the issues raised.

Data was collected on respondents age, farm size, types of crops grown, livestock kept, nature (positive or negative), type and frequency of human wildlife interactions among other variables. General observations were also made on farmers' fields and other activities carried out in relation to fresh fruit and vegetable supply.

Results and Discussion

Participants demographics

A total of 40 respondents participated in the study, with Karatina having 22 and Kathateni having 18 respondents. In Karatina, a total of 10 were women and a total of 12 were men, while in Meru, a total of 5 women and 13 men participated. The mean age of participants was 54 years, with the youngest being 27 years and the eldest over 100 years. Education level among respondents was generally higher in Karatina compared to Kathateni, and it varied as follows. In Karatina, there was 45% respondents with tertiary education, 23% with secondary level education and 32% with primary education. Kathateni had 28% with tertiary education, 50% with secondary and 22% with primary education.

Fruit and vegetables production and marketing in Karatina and Kathateni

There are at least 15 types of fruits produced in both Karatina and Kathateni. Bananas, passion fruit and tree tomatoes are the most produced fruits as shown in Figure 2. The diversity of fruits produced in Karatina is higher than Kathateni, which is attributable to climatic condition that anable production of a wider variety of fruits.

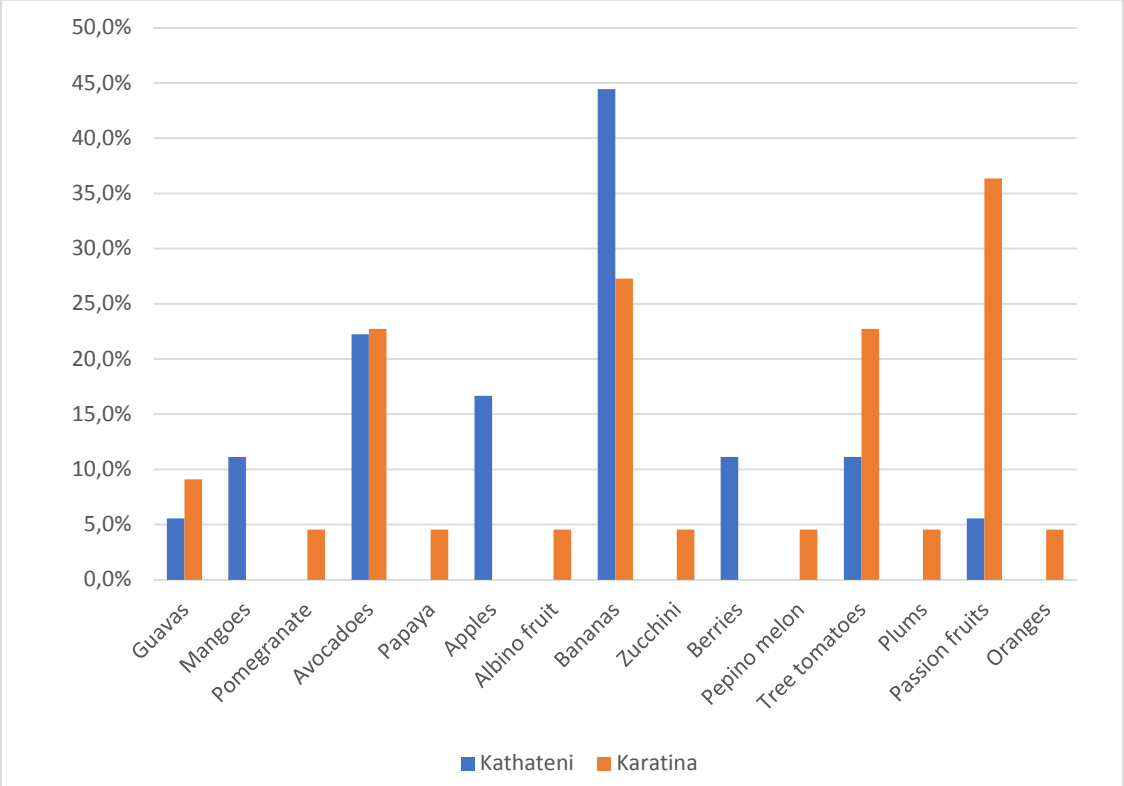

Figure 3: Types of fruits produced in Karatina and Kathateni (own research)

Vegetable production appears to vary with location, with the highest production in Karatina being cabbages, kale and spinach (Figure 3). On the other hand, Kathateni produces tomatoes, Kale and spinach in higher amounts. Farmers in Karatina appear to have embraced production of more exotic vegetables and fruits (e.g. promeganate, albino fruit, capsicum, amaranth and coriander) while farmers in Kathateni have generally retained more traditional fruits and vegetables.

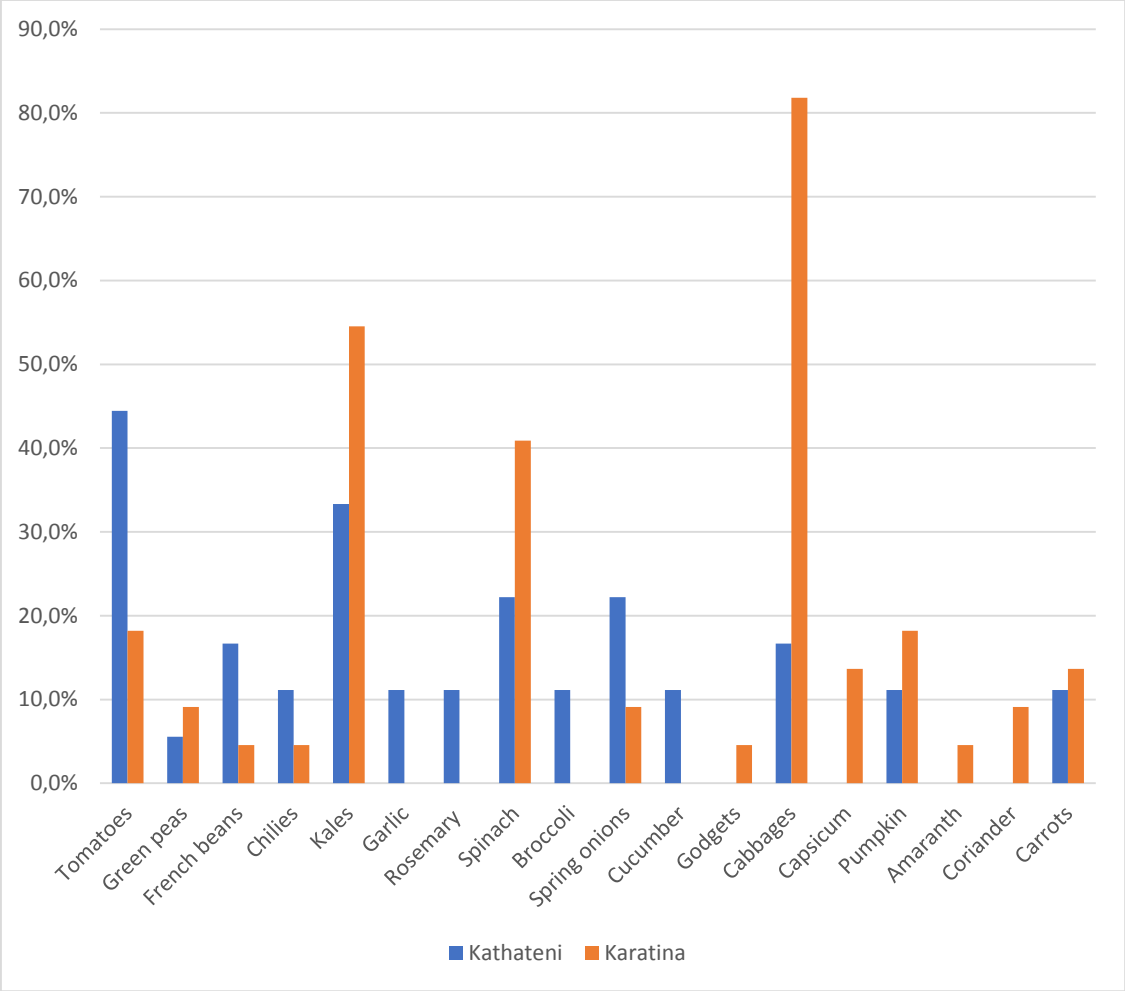

Figure 4: Types of vegetables produced in Karatina and Kathateni (own research)

Fruit and vegetables is sold to a variety of markets (Figure 4). Farmers in Kathateni have a wider range of market sources, including local open air market, brokers, supermarkets, nearby shops, neighbouring households and the international market through export. In Karatina, thne market for fresh fruit and vegetables is narrower, with produce sold to neighboring local market, brokers, nearby households and farmers cooperatives. İn both areas, a substantial amount of fruit and vegetable is sold to brokers. This was seen to have both advantages and disadvantages. Farmers can directly sell their produce to a broker thereby eliminating the cost of storage and transport, as well as the logistics

required to take the produce to the market. It also saves labour and provides them with more time to be productive in the farm which could have otherwise been spent marketing the produce and waiting for customers. With brokers farmers can be guaranteed of pay immediately compared to selling through other channels such as the cooperatives where they have to wait for pay monthly. However, several respondents reported that brokers can sometime take advantage of the farmer when they are less aware of the market price which gives them a greater burgaining power making them buy the produce at very low price compared to the price offered at the market. Brokers also make more money with less efforts while farmers realize low profit margins despite all logistics involved in growing the produce. In addition sometimes especially during the rainy season farmers are at the mercy of brokers and turn to them as a last resort because simililar commodities flock in the market and have to be sold fast before they go bad.

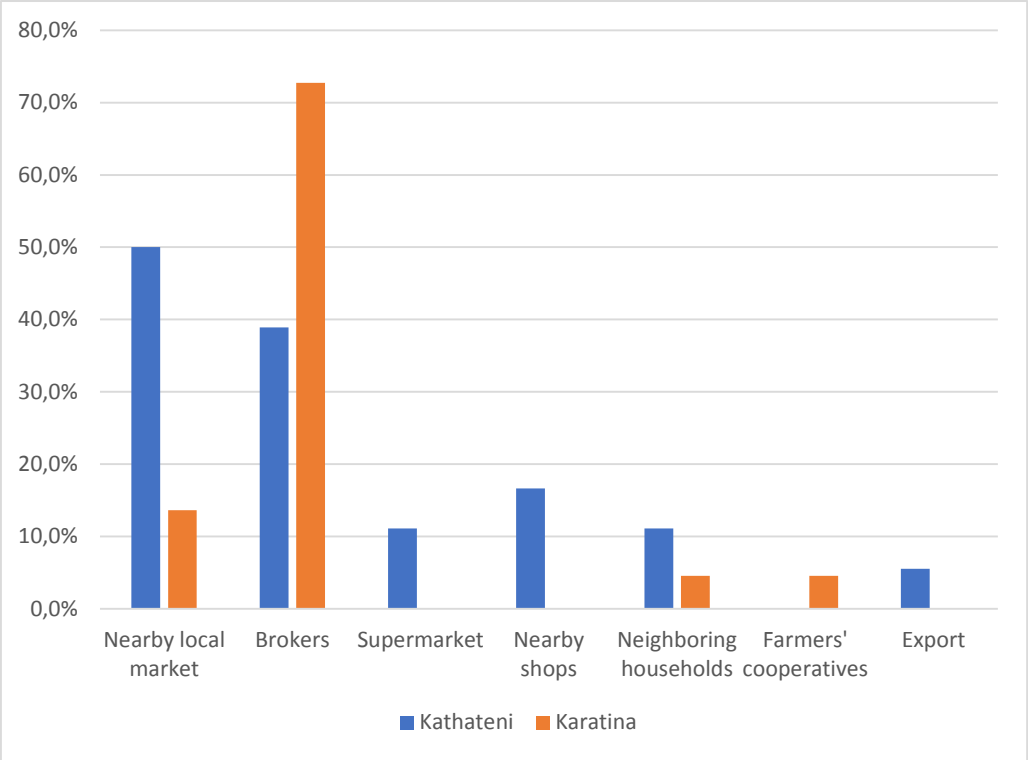

Figure 5: Dimensions of fruit and vegetable supply and the social ecological Framework (own research)

The socio-ecological parameters and their linkages in the fresh fruit and vegetable production and supply in Karatina and kathateni are described in Figure 6 and Figure 7. Results of this analysis demostrate that the robustness of fresh fruit and vegetation supply systems in both Karatina and Kathateni are undergoing a transformation, thereby subjecting the systems to a risk of failure. Both Karatina and Kathateni have

experienced tremendous population growth in the past 50 years leading to a reduction in the average size of the farms, as it is the practice of the communities to sub-divide their farms to the next generation of offspring. An increasing population has also increased demand for more land for settlement, which leads to less land available for cultivation. Our results indicate that the average farm size in Karatina and Kathateni are 1 acre and 2.7 acres respectively.

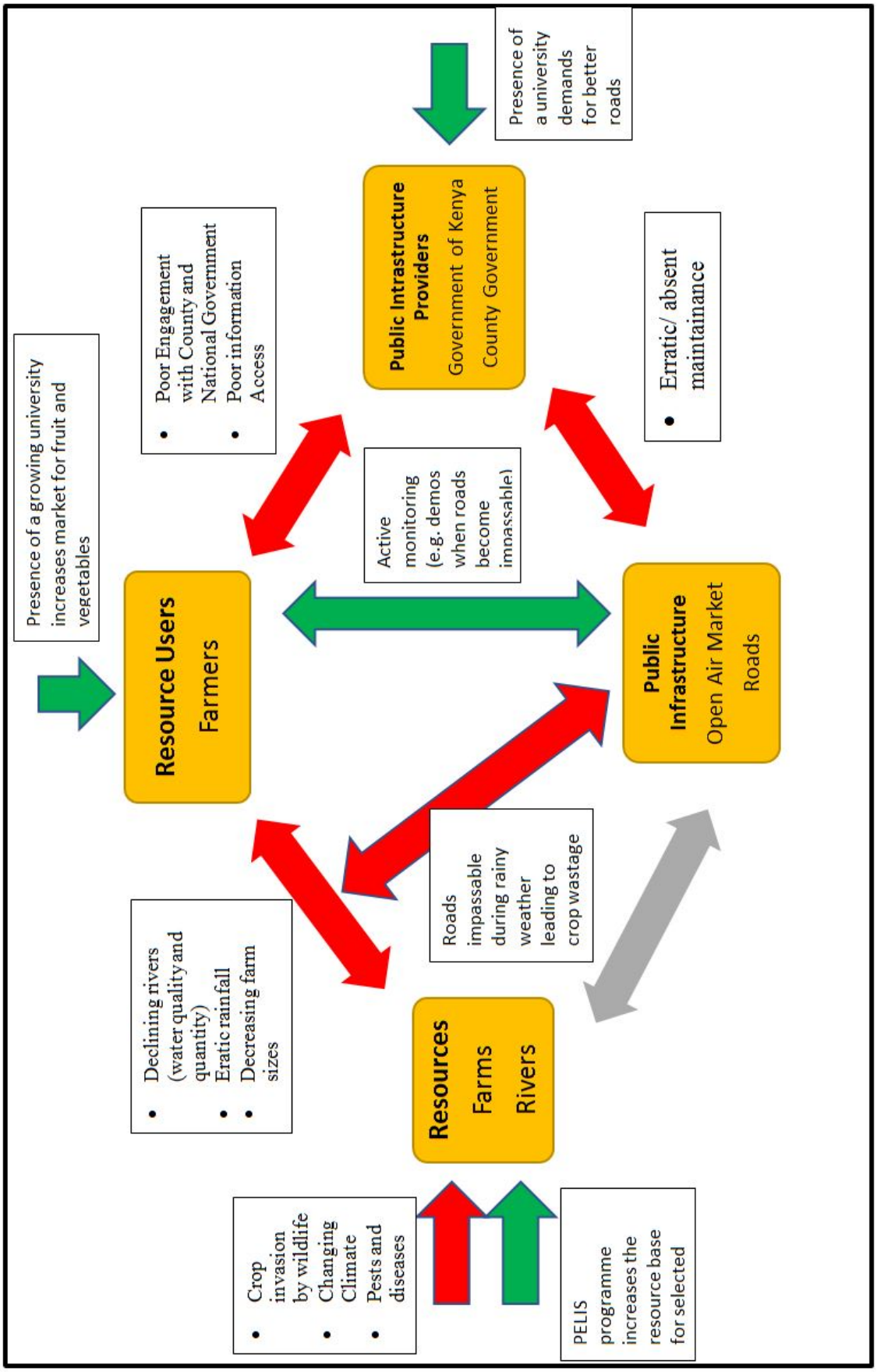

Figure 6: Robustness of fresh fruit and vegetable supply in Kathateni (adapted from ANDERIES et al. 2004)

Acknowledgement

The authors gratefully acknowledge EAGERLearn for allowing us undertake this research, Karatina University for assistance and arrangements at the community level in Kathatene and Gatei regions in the slopes of Mount Kenya and the communities for their dedicated co-operation and contributions towards the study. We would also like to thank various government departments for their enlightenment and provision of information on several aspects of the study. The insightful comments of several reviewers in the development of this paper are also greatly appreciated.

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How do fresh fruit and vegetables get to supermarkets in Kenya and Tanzania? – The interrelation between the expansion of supermarkets and the establishment of delivery systems/intermediaries for fresh products

CHRISTIAN SONNTAG

Background and relevance of the research

At present, retail in the Global South is experiencing a profound change through the appearance of chain stores (ALTENBURG et al. 2016; FRANZ & HASSLER 2011; REARDON et al. 2004). There is a rapid expansion of supermarkets in the study area, especially in Kenya (Figure 1; NEVEN & REARDON 2004; RETRAK 2018). In addition, these supermarkets increasingly have fresh fruit and vegetables in their assortment, which is of certain interest for the research project (Photo 1).

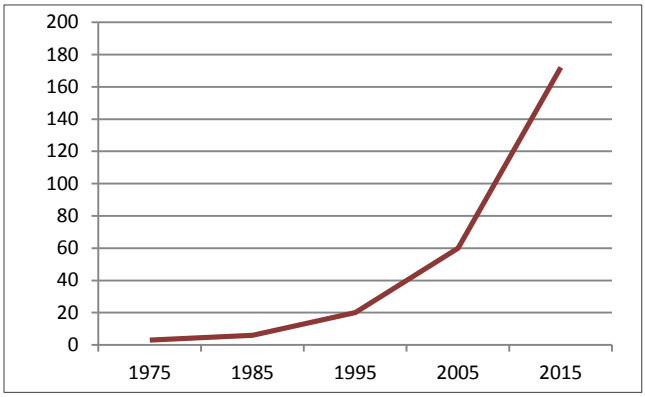

Figure 1: No. of branches of 5 largest supermarket chains in Kenya (Data: NEVEN & REARDON 2004; RETRAK 2018; own survey)

Photo 1: Supermarket in Dar es Salaam (Christian Sonntag 2018)

The relevance of the research project lies in the investigation of logistics in value chains, especially for agricultural products. The "logistics problem" continues to be of central importance in analyses of value chains (COE et al. 2008: 276). On the one hand, there are major challenges in the study area like an enormous post-harvest loss. This is related to infrastructural aspects such as storage, refrigeration, transportation as well as information and knowledge transfer (Photo 2 and 3). The retail system of a supermarket also requires a customized delivery system, especially in terms of quantity, quality and standards. On the other hand, there is only little research done concerning the organization of delivery systems by intermediaries between agricultural producers and

supermarket chains in the Global South. This study aims to clarify the relationship between the expansion of supermarket chains in Kenya and Tanzania and the establishment of delivery systems/intermediaries for fresh produce.

Objectives and approaches

Against this background, the following objectives were formulated:

1. Understand spatial-temporal expansion patterns of supermarkets in Kenya and Tanzania.
2. Understand different forms of organization of delivery systems between agricultural producers and supermarkets. →Typology of intermediaries
3. Find out which functions the different types of intermediaries take over in the organization of the relations between agricultural producers and retailers and whether they show upgrading dimensions (process, product, function).

In order to grasp Objective 1, considerations regarding location systems of services, location factors (e.g. infrastructure, accessibility, regional cooperation 'East African Community') as well as 'Internationalisation/Globalisation' processes are helpful (KULKE 2013). For Objectives 2 and 3 the 'Global Value Chain' approach (GEREFFI et al. 2005; COE et al. 2004), especially the considerations on "governance" structures, meaning the way of the coordination/ organization between actors (market, hierarchy, modular, relational, captive) and the 'Global Production Network' approach (COE et al. 2008; HENDERSON et al. 2002), which includes the horizontal network relations to analyze competition and power relations, are relevant.

Photo 2: Vegetable delivery to a supermarket in Nairobi (Christian Sonntag 2018)

Photo 3: Muthurwa Market (wholesale) in Nairobi (Christian Sonntag 2017)

Methodology

Both qualitative and quantitative research methods are used in this project. The focus is on qualitative (expert) interviews with relevant stakeholders from the areas of production, logistic and retail. This is done using the problem-centered interview method. Furthermore, semi-structured surveys are conducted with representatives of supermarkets and intermediaries (including price monitoring). It is important to compare the same products in all case studies and supermarkets. For this purpose, the following products were selected based on perishability and handling: sukuma wiki, managu, potato, onion, nduma, tomato, banana, papaya, mango and imported orange. In addition, the proven method of "Value Chain Mapping" is used. The supermarket chain representatives are asked to name their current suppliers. In addition, a GIS analysis is performed. Maps will be created for all case studies regarding the spatial-temporal expansion patterns of supermarkets. This is done with the help of the open source software QGIS for a sustainable use of the GIS data, especially after the project. The focus is on eight cities, the four largest cities in each country regarding population. The selection was made on the basis of the importance of these cities in relation to the research topic (Figure 2).

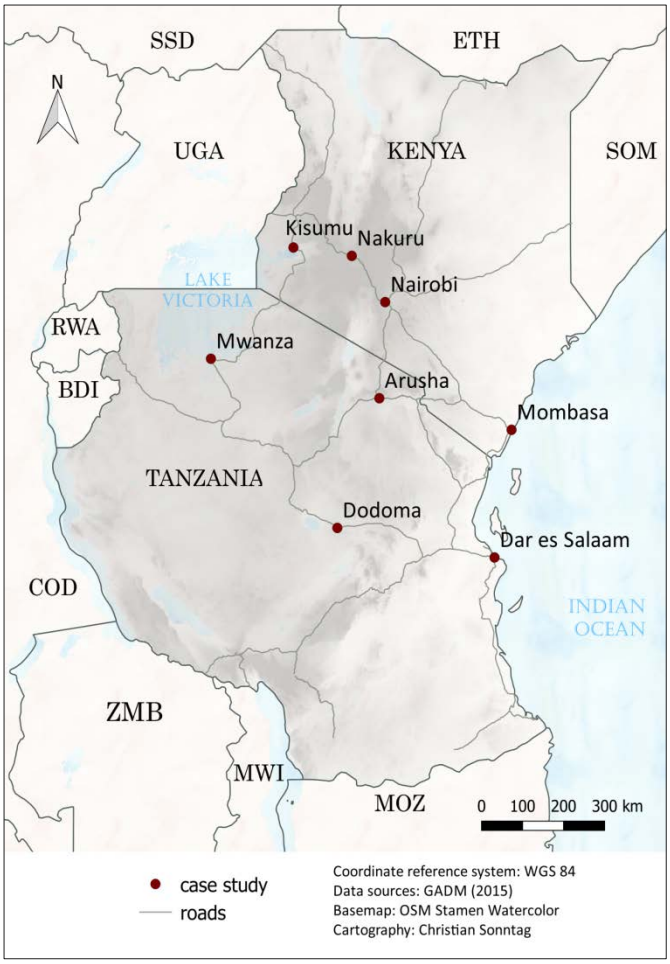

Figure 2: Case studies (own map)

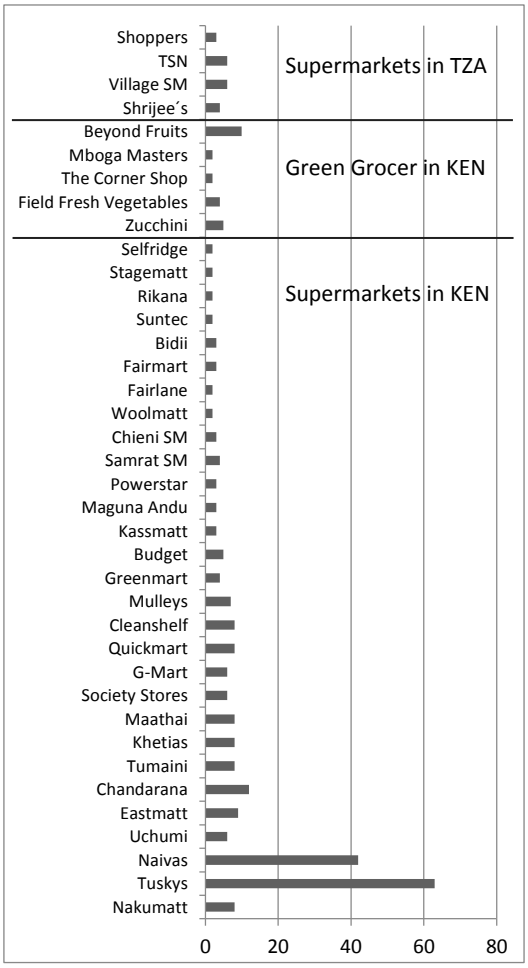

Figure 3: No. of branches of domestic supermarkets/ greengrocer with at least 2 branches (Data: own survey, as of May 2019)

Spatial-temporal expansion of supermarkets

In Kenya, the expansion of supermarkets has been dominated for decades by domestic retail chains (NEVEN & REARDON 2004; RETRAK 2018). In Tanzania, on the other hand, some retailers from South Africa and later Kenya opened branches at the turn of the millennium, but later had to close again (NANDONDE & KUADA 2018). Currently, we see both expanding and struggling domestic supermarket chains in both countries as well as multinational enterprises gaining a stronger foothold in Kenya and Tanzania in the last years (Figure 5 and 6).

In addition to the few large supermarket chains, there are many small chains and over 100 owner-managed supermarkets in Kenya and Tanzania. All domestic supermarket chains (headquarter in Kenya or Tanzania) with at least two branches are illustrated in Figure 3. In addition to the domestic supermarkets, there are also multinational

enterprises that have been opening branches in Kenya and Tanzania for several years (see Figure 6).

There are first research findings on the spatial-temporal distribution patterns of supermarkets. It becomes clear that in Kenya far more supermarkets already have been opened than in Tanzania. This is due to different historical, economic and political developments such as degree of informality in retail, market liberalization and foreign direct investment. Figure 4 shows the current spread of supermarket chains with 5 or more branches. Supermarket chains first establish themselves in the national metropolises and urban centers, then expand into other major cities nearby before they expand into the smaller cities and rural regions (see also DANNENBERG 2013; KULKE et al. 2014). In addition, so far supermarket chains have been opened branches mainly in the CBD, along major transport routes and in areas with middle and high income (own survey). The latter is due to the profit-oriented spatial logic of retail companies.

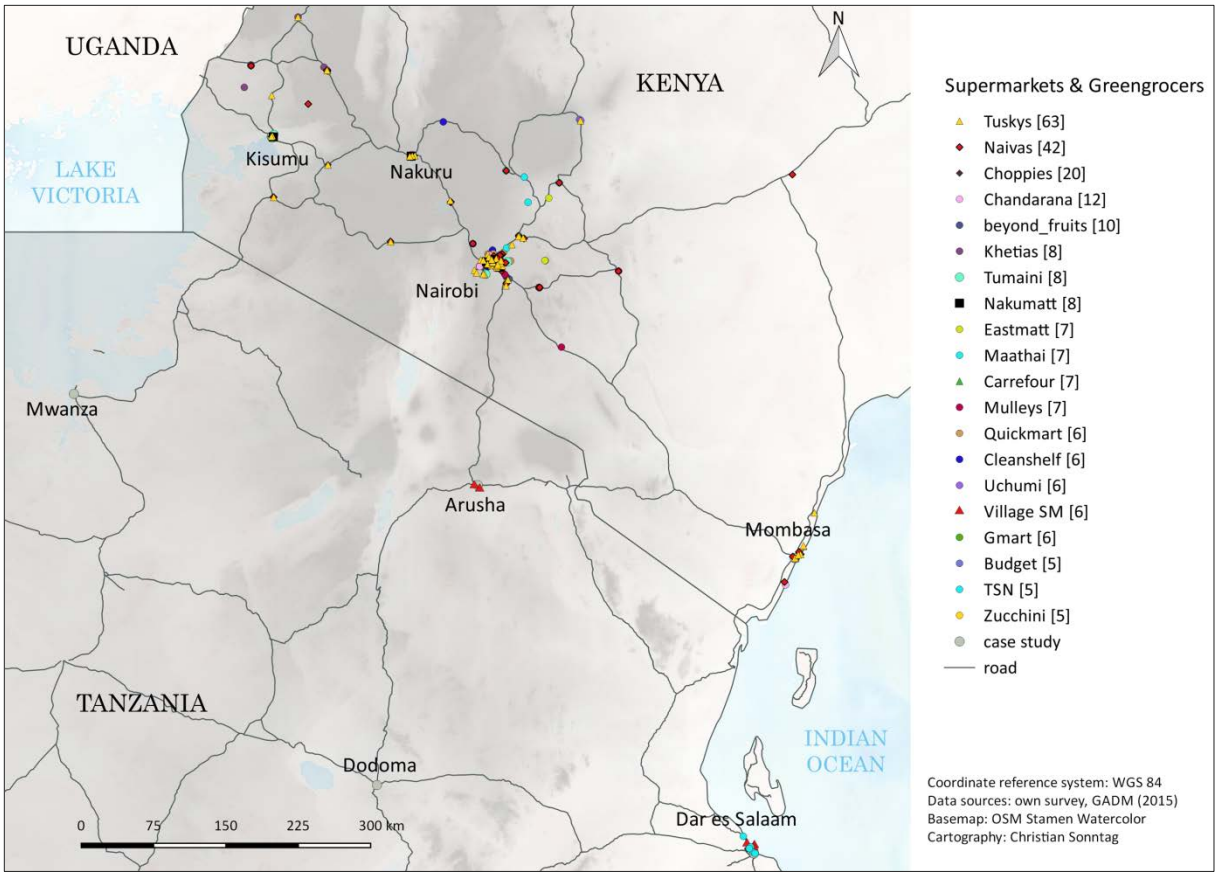

Figure 4: Branches of supermarket & greengrocer chains with more than 5 stores in 2019 (own map)

There is currently an ongoing transition in the retail market in East Africa. While former Kenyan supermarket chain giants are currently facing problems (see Nakumatt and

Uchumi, Figure 5), multinational retailers are taking advantage of the gap and expanding into Kenya and Tanzania (Figure 6). Nakumatt and Uchumi have had to shut down a large number of their branches over the past two years, including all branches in Tanzania. On the other side, multinational enterprises have opened more than 30 stores in the last 5 years and plan to open many more in the short and medium term (Figure 6).

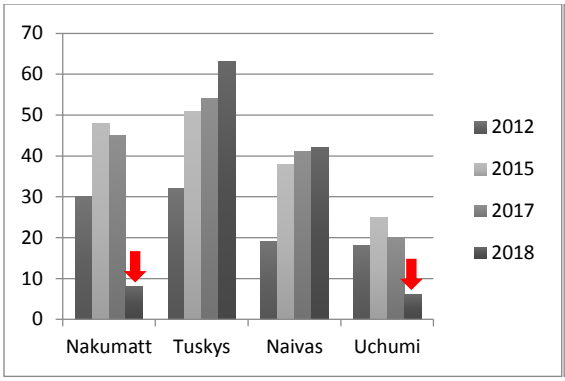

Figure 5: Development of the (former) "Big 4" in Kenya (Data: KIMANI 2012; MASINDE 2016; own survey)

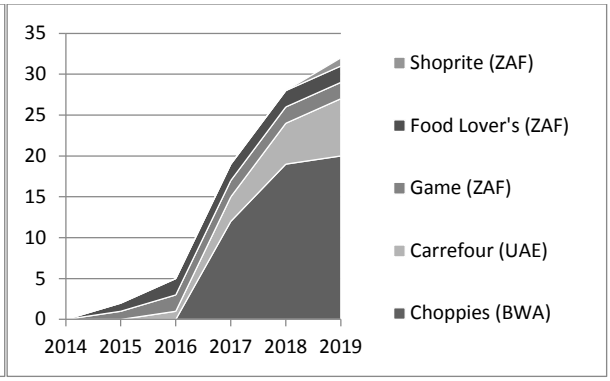

Figure 6: No. of multinational supermarkets in KEN & TZA (Data: own survey)

Organization of delivery systems between agricultural producers & supermarkets

Supermarkets created a third marketing system for fresh fruit and vegetables in Kenya in the second half of the 1990s next to the "classical domestic system" and the "export system" (NEVEN & REARDON 2004: 680). However, our research shows there is no single, definable, universal system of fresh produce supply to supermarkets. The organization of delivery systems of fresh fruit and vegetables to supermarkets is very complex and still often flexible. Generally valid statements for the one system are difficult and make little sense. Types of intermediaries should therefore be explained using various models used by supermarkets. Based on the types, functions and upgrading dimensions of the intermediaries can be explained. In this regard, 5 different models were identified and defined (work in progress), which are shown in Table 1. Table 1 also shows what supermarket uses what system and who are the intermediaries and actors involved. There are centralized, decentralized and mixed models, there are completely new models with specialized intermediaries and models that are more akin to the long-standing 'classical domestic system' which includes different middlemen (brokers) and

wholesale markets. Based on these models, the intermediaries involved can be typed and examined.

Table 1: Models of delivery systems for fresh fruit and vegetables to supermarkets (own survey)

Forms of organization of delivery systems between agricultural producers and supermarkets	**Supermarkets & Greengrocers (examples)**	**Intermediaries and farmer/suppliers involved**
3PL model (centralized, specialized)	*Nakumatt, Tuskys, Chandarana, Shrijees, Homes*	3 PL provider (*Fresh an Juici*, *The Corner Shop*); brokers, importer, exporter, (contract) farmers
Mixed model (centralized & decentralized)	*Choppies, Village*	(contract) farmers, brokers, importer, exporter
Decentralized model (country-wide)	*Naivas, Carrefour, Game, Shoppers, Shoprite, Food Lovers, Uchumi,* owner-managed supermarkets	(contract) farmers, exporter, importer, brokers, wholesaler, farmers
Centralized model using collecting points (regional, e.g. Nairobi)	*Field Fresh Vegetables,* regional & smaller chains	farmers/supplier bring FFV direct to collection points; retailer distributes FFV with own vehicles; importer
Import model	*TSN*, small chains, owner-managed supermarkets	importer (*South Lemon*, *Mbezi Fresh*), broker

As an example, the '3PL model' is presented below (Figure 7). 3PL means third-party logistics, an external logistics service provider. These specialized companies take over functions such as washing, storing, sorting and transporting (with its own vehicles) of fresh fruit and vegetables. But also the knowledge transfer plays a very important role.

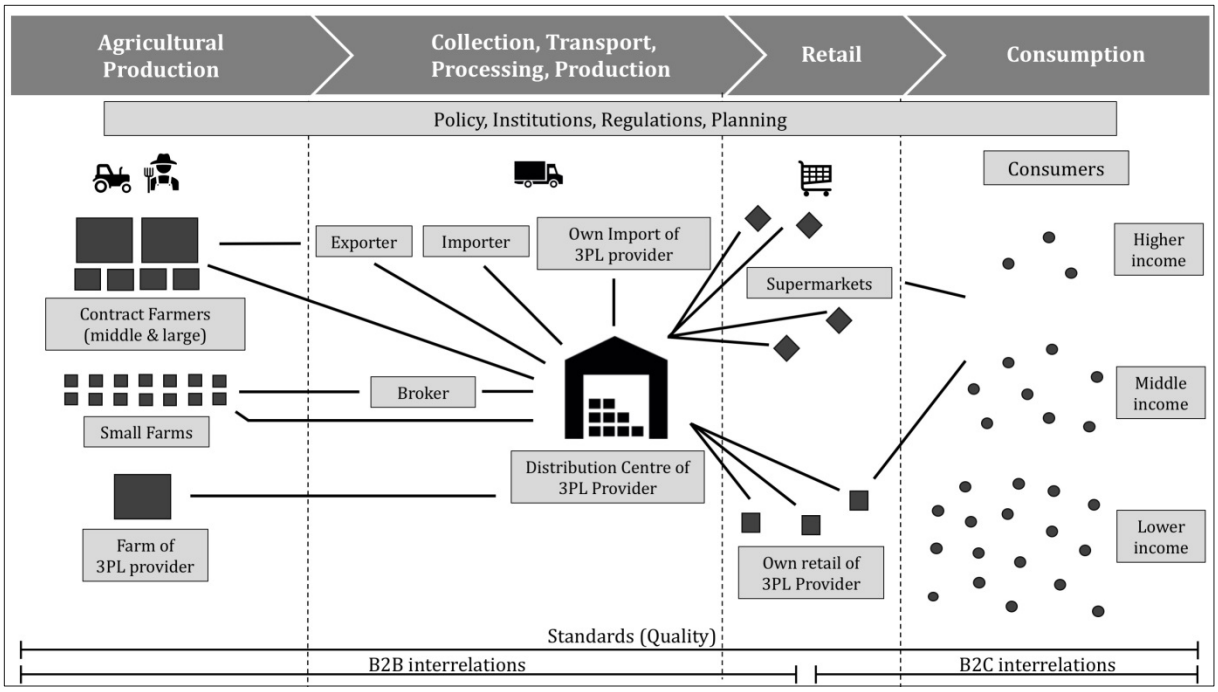

Figure 7: 3PL model (own draft)

Various other actors, such as farmers, brokers, exporters and importers are integrated into this model and deliver to a central company-owned logistics center. Sometimes these companies have their own farm as well as their own retail and can thus control the entire value chain. This '3PL model' shows a trend towards specialized intermediaries in the fruit and vegetable trade, which did not exist in the study area 10 years ago. These companies use mobile technology, packaging houses, cooling infrastructure and specialized transport vehicles. It should also be noted that this move towards specialized intermediaries is taking place not only in rather formal supermarket retail but also in the extremely important (informal) market and street selling of fresh fruit and vegetables. An example is the B2B marketplace platform Twiga Foods, which supplies market/street vendors ('mama mbogas') throughout Nairobi and is already the "largest supplier of fresh fruit and vegetables in Nairobi" (SME FINANCE FORUM 2018).

Conclusions

In summary, a dynamic phase of transition in the retail landscape in Kenya and Tanzania is happening right now. There are some large domestic supermarket chains, as well as a large number of small chains and owner-managed supermarkets, with a big difference between Kenya and Tanzania regarding the prevalence and penetration of supermarkets. In addition, multinational companies have been entering successfully the supermarket landscape in Kenya and Tanzania. It will be interesting to see, who will dominate the market in the near future.

Regarding the organization of delivery systems of fresh fruit and vegetables between producers and supermarkets, it becomes clear that different delivery systems co-exist in parallel (5 different models currently identified). Results also show that intermediaries undertake different functions and that there is a trend towards specialized intermediaries in the logistics of fruit and vegetables for supermarkets, who are using mobile technology, logistic centers and own vehicles.

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Food production and challenges – the case of Machakos County in Kenya

PARITA SHAH

Introduction

Food production has always been a core of the past and present generations. The Ancient Egyptians made sure that they grew enough food through irrigation to feed their increasing population. Similarly on the lands of the Mohenjo Daro in India agriculture was the green light to the success of the civilizations. Israel is one of the 20th century countries which has converted itself from a desert to an oasis of food. The future generations are also being driven towards food production by international mandates whereby all countries through the United Nations (UN) are geared towards meeting the Sustainable Development Goals (SDGs). The SDG Number 2 is specially geared towards food production and its provision. It states "end hunger, achieve food security and improved nutrition, and promote sustainable agriculture" (OSBORN et al. 2015). The sub-sections of this goal are:

a. by 2030 end hunger
b. by 2030 end all forms of malnutrition
c. by 2030 double the agricultural productivity and the incomes of small-scale food producers
d. by 2030 ensure sustainable food production systems and implement resilient agricultural practices
e. by 2020 maintain genetic diversity of seeds, cultivated plants, farmed and domesticated animals and their related wild species (Osborn et. al., 2015).

In spite of all efforts being geared towards successful food production, in many parts of the developing world, food is a real problem as people either do not have access to food as production levels are low or what is produced does not reach the market (UN 2018). Furthermore, the projections by Food and Agricultural Organisation (FAO 2016) indicate that the available arable land per person will decrease further by the Year 2050 and will be less by one-third of the land which was available in 1970. This decline is unprecedented and will continue to occur due to factors like population growth, climate change, reduction in water supplies, increase in drylands, overfishing, soil depletion and

urbanization amongst other factors (FEDOROFF 2015). This is shown in Figure 1 whereby the arable lands have been constantly declining globally and the world is running short of farmlands to feed its ever growing population (FEDOROFF 2015; FAO 2016).

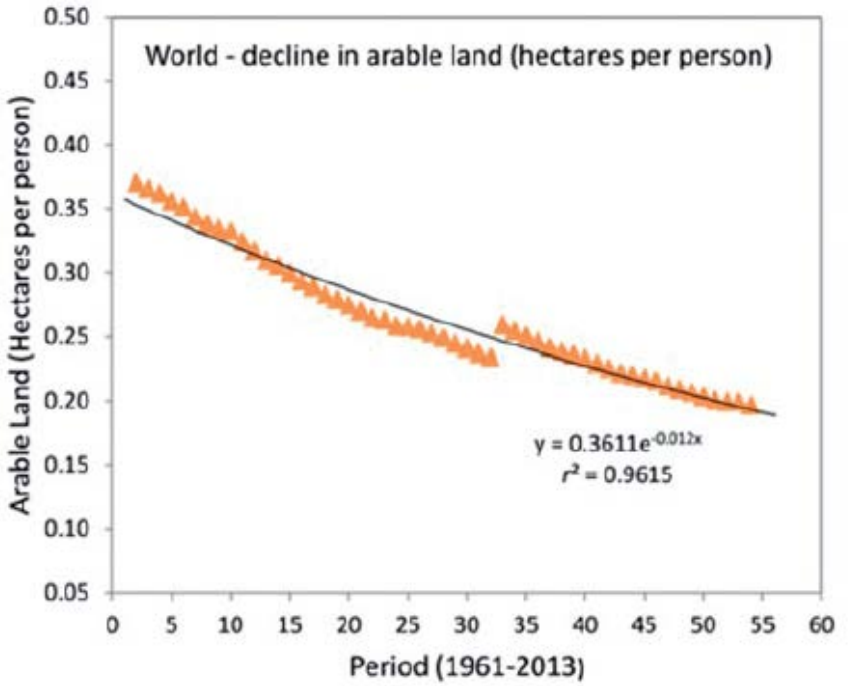

Figure 1: Decline of global arable land from 1961-2013 (source: Data from FAO 2016)

Kenya has a vision to achieve food security by 2022 under its BIG 4 Agenda where food security, housing, health and manufacturing have been given the main priorities. Currently the country relies on only 11% of her land mass for food production. Most of the country's farmers are small scale producers and they rely on rain-fed agriculture. In normal situations, their demand is usually at par with supply. However there are situations when food is either less or more in many of these production zones. Problems arise in both situations but this research focuses on when the food is more and it is not sold reflecting market challenges.

This paper's main objective was to see the connection between food production and market challenges. The research was based on determining the types of market gardens for growing crops; identifying the crops grown by farmers, the markets for the crops and to evaluate the market challenges faced by farmers.

Food production and challenges

Between the period of 1960 and 2015, food production increased globally due to Green Revolution, changes in technology, sustainable utilization of resources, increase in the conversion of land for agriculture and improved provision of water. In the same period, globalization increased and food supply chains have increased from processing, packaging and food preparation. This indicates that there is less wastage of food (FAO 2016). However there is still a major sign of distress as since mid-1990s, the yields of most crops has slowed down especially in the continent of Africa and some parts of Asia (CASSMAN et al. 2010; ALSTON et al. 2010).

As most areas of the world move from rural to urban transition, food security has a key role to play. This is because there is more focus on development than food security. While small scale growers concentrate on food production, they face problems like the size of land, droughts and climate change related problems, diseases, price fluctuation, market changes, changing diets, transport, post harvest losses and changes in demand (FAO 2017). Thus food security is defined as "a situation that exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 2009).

In most African countries, agriculture is the backbone of the economy. These countries export a lot of horticultural products and at the same time earn good foreign exchange. For example in 2005 Ethiopia's horticultural exports rose from 13 million USD to 550 million USD in 2016 (African Development Bank Group [AFDB] 2016). In the case of Kenya the horticultural exports rose from 21 billion Kenyan Shillings in 2000 to 97 billion Kenyan Shillings in 2015 (ibid). However these figures can be improved with improvement in size of land, transport, better price information and facilitation of markets (WORLD BANK 2017).

Studies carried out by ALEXANDRATOS & BRUINSMA (2012) and LI & SIDDIQUE (2018) indicate that food security will face challenges in terms of scarcity of natural resources. These natural resources will suffer from over-exploitation, unsustainable use and environmental degradation leading to food insecurity. One example is in the livestock sector where competition for good land and grass is forcing pastoralists to migrate from

one place to the other. Furthermore during times of drought or if early warning signs of drought is given, many pastoralists fail to sell their cattle as they may not have transport to supply the cattle where the market is or people may not have the purchasing power to buy the livestock.

Background of case study: Kenya and Machakos County

Kenya is in East Africa and borders Uganda to the West, Republic of Tanzania to the South, Somalia and Indian Ocean to the East and South East, Ethiopia to the North and South Sudan to the North West. The country's population stands at 45 million (Kenya National Bureau of Statistics [KNBS] 2017). Out of the country's 582 646 km^2 only 16% of the country has agricultural potential. From the 16%, 31% is used for cropland, 30% for grazing, 22% for forestry while the rest is used for settlement. The rest of the 84% is arid and semi-arid land (ASALs) and mainly used for agro-pastoralism, pastoralism and ranching (FAO 2018).

This research focuses on the food security and challenges in the County of Machakos. This County is rich in terms of land, soil, minerals, forests and wildlife. However it is a challenge to be consistent in terms of agricultural crops as the County is an ASAL so water is a real problem. Most of the times the County's agricultural demand exceeds supply coupled with issues of climate change like drought, desertification and diseases. Furthermore there is competition for water from industries, livestock as well as domestic use. Machakos is also challenged in terms of food security through poor farming methods, low adoption of drought tolerant crops, use of poor quality seeds and poor access to farm inputs (GoK 2009; Mwangi and Mundia 2014). In spite of all these, the largest percentage of the county's land is geared towards agriculture, followed by barren land, forest land, built up area and water body. This is shown in Figure 2.

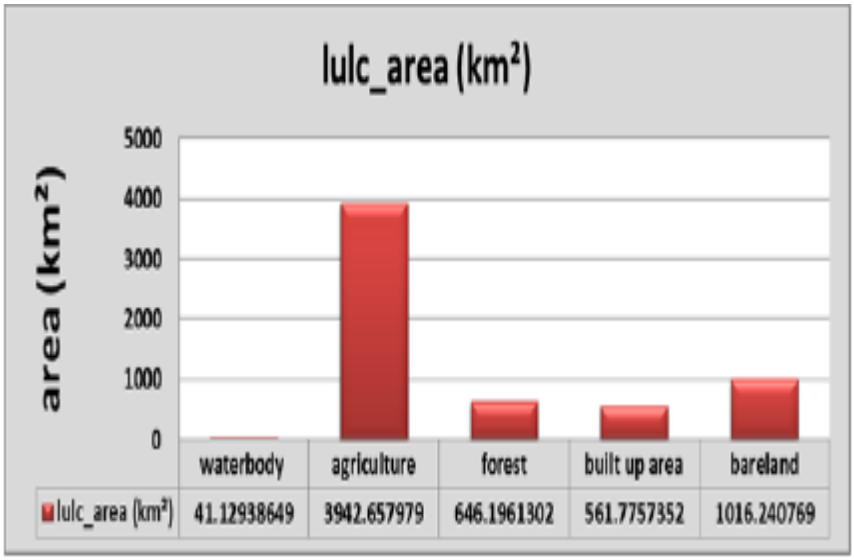

Figure 2: Machakos Land Use and Land Cover (source: MWANGI & MUNDIA 2014)

Methodology

Primary data was sourced using questionnaires, observations, informal interviews and photographs. A total of 200 respondents were randomly selected using the hat method from twelve locations namely Athi River, Mavoko, Kinanie, Kyumbi, Kathekakai, Ngelani, Mutituni, Mumbuni, Kitanga, Kenya Meat Commission (KMC), Mugoti and Matatani. The selection was done based on the total number of population from the data base of Kenya National Bureau of Statistics (KNBS 2009) which indicated that Athi River had the highest number of people thus the research selected 30% of the respondents from there, followed by Kinanie, Mavoko, Kyumbi, KMC, Mathatani, Mutituni, Ngelani, Mumbuni, Kitanga, Kathekakai and Mugoti.

The study used both descriptive and inferential statistics. The primary data comprised of the nature of market gardens, type of crops one grew, value added to the crops before being sold, market for the crops and challenges faced.

Results and Discussion

The respondents comprised of 52.5% (105) males and 47.5% (95) females. The respondents were asked on their farm size and the typology of the market gardens. The results indicate that over 80% of the respondents had less than 3 acres of farmland. From this 80%, the majority had between 0.5 to 1 acres of farmland. This is because most of them have either sub-divided the land amongst their siblings or are too poor to have big plots. A similar study was done by Ndiema in 2010 in two counties of Kenya namely Kajiado and Narok whose results indicated that 54.6% of the farmers had small scale farms of less than 5 hectares.

According to one lady respondent in Machakos County, her one acre plot hardly sustained her family indicating that she had to source more food from elsewhere. The statement according to her is as follows:

"I cultivate my one acre farm using traditional methods. I still have to balance farming together with my other family chores which include caring for my children, fetching water, cooking and taking children to school. I am forced to buy food occasionally as my land doesn't produce enough for my family because of increase in heat, less water, diseases and I can't afford fertilizers as my soils are poor. At times when I have extra food, I don't have buyers".

In terms of the types of market gardens, there were seven categories namely home gardens, public open space, storey gardens, tins and pots, institutional lands, road reserves and own farms. The results indicate that majority (57%) had home gardens, followed by those who used public spaces, others used institutional lands and road reserves, some opted for growing food in tins and pots, others grew crops on their roof tops and very few had their own farms (Figure 3).

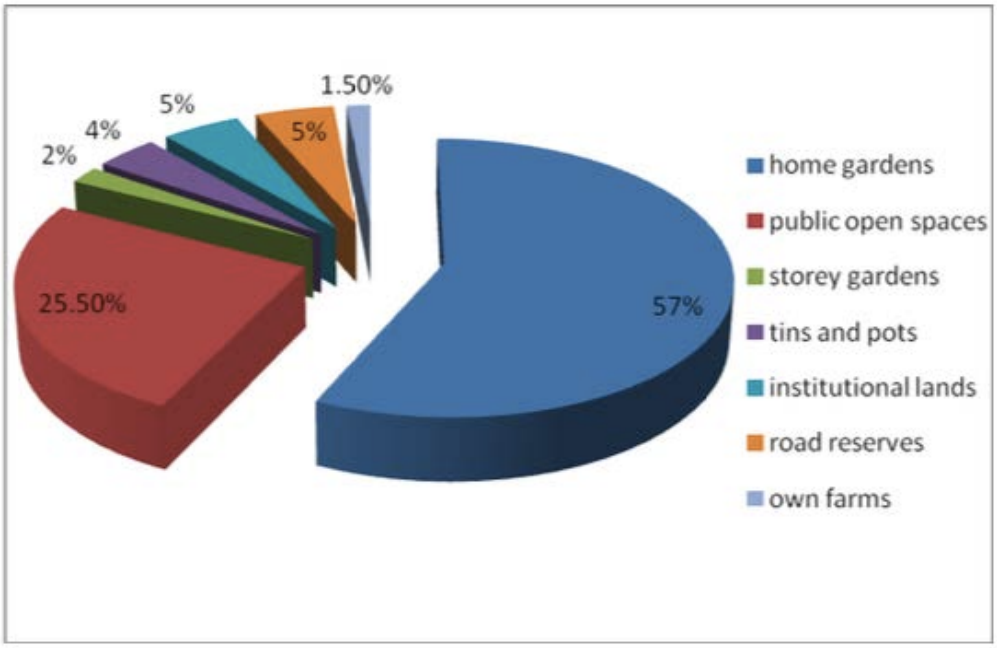

Figure 3: Typology of market gardens in Machakos County (source: own survey)

As the results in Figure 3 indicate, most people grow food in their own gardens. This means most of the crops are grown for subsistence. In case there is surplus, then the farmers would be in a position to sell. Furthermore, the results also indicate that over 25% grow crops in public land. This is not the right approach and anytime this land could be fenced or trespassing it could become a problem resulting in farmers becoming "landless farmers". Other farmers have opted to carry out farming on road reserves which is a very temporary solution as these areas will soon become roads and the farmers will have to look for alternatives. In fact many farms on the road reserves have been cleared. Plate 1A shows a farm on a road reserve in October 2017. In August 2018 the farm was no longer there as shown in Plate 1B.

Plate 1A: Food production on road reserve (Parita Shah 2017)

Plate 1B: Road reserve (formerly as shown in Plate 1A as farm) converted to road (Parita Shah 2017)

The respondents were also asked on the type of crops they grew. This is shown in Figure 4 which indicates that the staple crops like maize and beans are the commonly grown crops by farmers. This is because they use them for their own subsistence and since this is staple food, most of the extra crops are sold. Furthermore, a cross-tabulation was done to see the typology of the farm and the crop grown. Results indicated that maize and beans were grown by all irrespective of the type of market gardens. This is because they use maize and beans as their daily food.

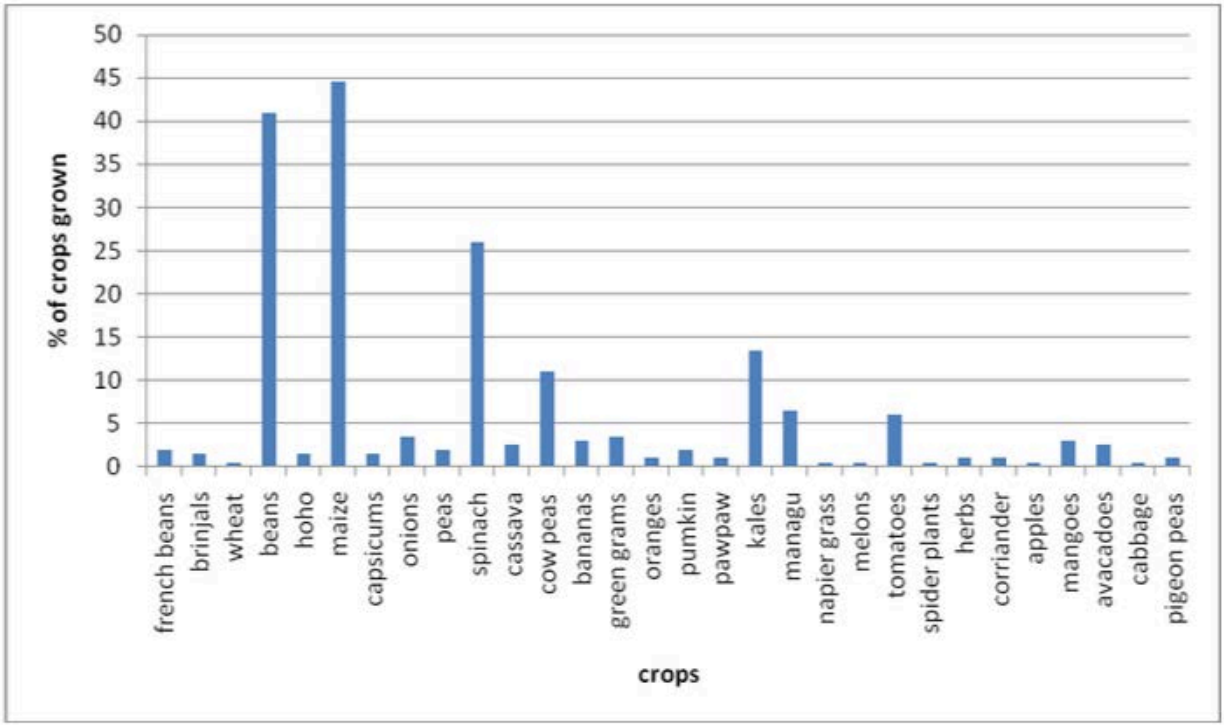

Figure 4: Crops grown by farmers in Machakos County (source: own survey)

The respondents were also asked if they sold their crops. From 200 respondents, only 45.5% (91) sold their crops while 54.5% (109) did not. This is shown in Figure 5.

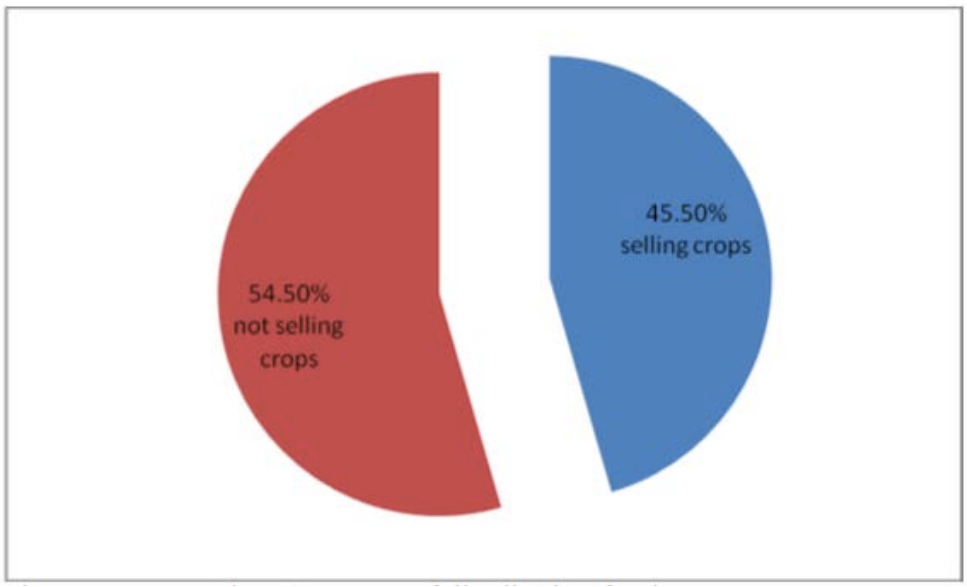

Figure 5: Respondents' manner of distributing food crops (source: own survey)

The results indicate that since most people are small scale farmers they hardly have the opportunity to look for small markets. This is common throughout the country (OMACHE 2016; OCHIENG et. al. 2016). The farmers who had surplus were also asked if they sold their crops by adding value or they just sold them in their raw form. Only 1.5% of the respondents stated they added value to the crops before selling them. These 1.5% of the respondents stated that they sun dried their crops before selling so that they would not go bad.

The farmers were also asked on the market challenges they faced. The challenges raised by the farmers were transport, high costs of sending the crops to the markets, flooding of the markets with the same crops, lack of customers, expensive labour, fluctuating prices, lack of space to display crops, competition, climate change resulting in poor roads associated with flooding and droughts, poor quality crops, brokers and security. According to most respondents, transport was the main challenge followed by lack of or insufficient markets. This is shown in Figure 6.

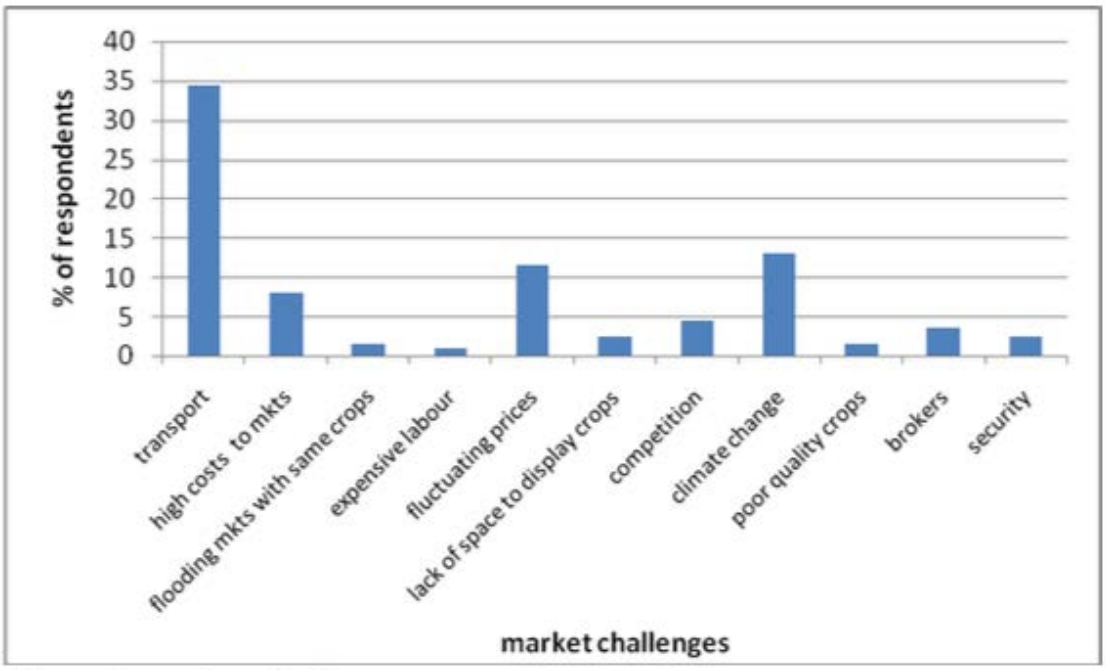

Figure 6: Market challenges (source: own survey)

According to McCalla (2001), most challenges faced by farmers globally are due to the fact that they are small scale and most markets want farmers with huge supplies. At the same time McCalla (2001) shows that the falling crop prices discourage farmers from taking any surpluses to the market. Lack of markets due to competition is one of the biggest challenges posed by farmers. Farmers in the UK complain of competition with large scale farmers. This is similar to the findings of this study.

Research by FAO (2018) indicates that transporting food to the market in many areas in the continents of Asia and Africa is a real problem. This is because of increasing urbanization. As predictions by the United Nations (UN 2014) indicate that over 66% of the people will be living in urban areas, transporting food will be one of the biggest problems as it will be expensive. Currently 45% of the world's population lives in urban areas thus transporting food to them is an expense (FAO 2018). In Machakos County itself most of the farmers (respondents) stay in rural and peri-urban areas and when they have to supply food to the big towns like Athi River and Machakos, it is a costly business.

FAO (2018) also indicates that climate change will be the most hindering factor in making crops reach the market. Infrastructure will be hampered during disasters like

floods. The respondents of this research have already indicated that natural disasters due to climate change are hampering efforts to transport food to towns and cities.

Recommendations and Conclusion

Machakos County needs to be sufficient in terms of food production. The farmers must produce enough so that the County can feed itself. The County Government should encourage small scale farmers to at least have their own piece of land. Furthermore these farmers should also be trained to use modern technology which would help them produce more food within a short time and improve crop quality. The County Agricultural Officers should also take the initiative to help farmers look for markets the same way large scale farmers are helped. Challenges like transport, competition, poor quality crops and security should be the responsibility of the County Government. They should also look at the possibility of providing subsidized transport to farmers to take their crops to the market. This would also help in removing brokers from the system and encouraging farmers to generate more income. Machakos County having the potential to supply the whole country with food should ensure that they are sustainable by improving governance and boosting farmers' perceptions. The County should also come up with their own policy on agricultural production which could have similar strategies like the European Union's Common Agricultural Policy (CAP). Farmers who produce excess should also be encouraged to develop value for their crops and improve on the value chains. This would help the County meet the SDGs of no hunger, BIG 4 Agenda of the Government and Vision 2030's agenda of food for all. The Machakos County Government should be getting and focusing on stakeholder investments in agriculture, fishery and forestry and at the same time concentrating on research and development.

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Value chain concept of GIZ and practical examples from Kenya

DOMINIK FORTENBACHER

A value chain is the sequence of activities required to make a product or provide a service. In itself, this is a simple idea: everyone know that ketchup started as a tomato that had to be harvested, transported to a food-processing factory, smashed, refined, bottled, labelled and sold to retail.

What not everyone may know are the numerous additional activities carried out along the chain, for example: the certification from where the tomato comes from, the cooling chain which needs to be considered for transport over long distances, the cross-border inspection and quality control, etc.

The idea of a value chain becomes useful for analytical and policy purposes, especially in development policy. The promotion of value chains is a fundamental concept of development policy. Based on thorough Value Chain analyses, GIZ supports upgrading strategies for particular industries, together with all relevant actors. Value Chain development mobilises private and public investment funds. The main objective is to ensure that economic growth generates broad-based and sustainable social benefits and contributes to poverty alleviation. It should also lead to more efficient use of energy, water and other resources.

GIZ bases its Value Chain strategy on growth opportunities, focusing attention on the potential for alleviating poverty, creating employment and improving resource efficiency. Women are often at the heart of the work in view of their important role in Value Chain development.

The implementation of Value Chain programmes is guided by the following principles:

1. Value chains are selected for promotion in accordance with economic, ecological and social criteria. These criteria are frequently embedded in national agricultural or industrial development policies.
2. GIZ collaborates with private companies, service providers and public institutions as our main partners in value chain promotion.
3. GIZ provides advice and facilitate technical and organisational innovations, which may include initial financial support. While GIZ cooperates closely with companies buying produce from partner countries and with local businesses, GIZ does not directly engage in the Value Chain business operations.
4. With a view to achieving long-term structural change, GIZ works to enhance the expertise and capacity of our private and public partners.

GIZ uses the ValueLinks methodology and instruments to shape its interventions and services. ValueLinks is structured according to the project cycle and provides the foundation for our services. These include:

1. Project design: GIZ develops and plan Value Chains programmes and projects on behalf of governments, foundations, industry organisations and private companies.
2. Selection of value chains: GIZ develops options for market development on the basis of criteria agreed with partners.
3. Value chain analyses: ValueLinks provides the methodological know-how for value chain mapping and for economic, social and environmental assessments of Value Chains, including gender analysis.
4. Advice on sustainable development strategies: GIZ provides advice on the formulation of appropriate Value Chain development strategies.
5. Facilitation of change processes: GIZ accompanies and advises on the implementation of Value Chain development measures agreed with partners.
6. Implementation of technical, business and institutional solutions: Important fields of upgrading include improving business models, promoting business linkages and contracting, engaging in horizontal cooperation, providing technical and financial services, establishing an appropriate regulatory framework, and agreeing quality and sustain-ability standards.
7. Impact monitoring and data management: Services include the collection and management of information.

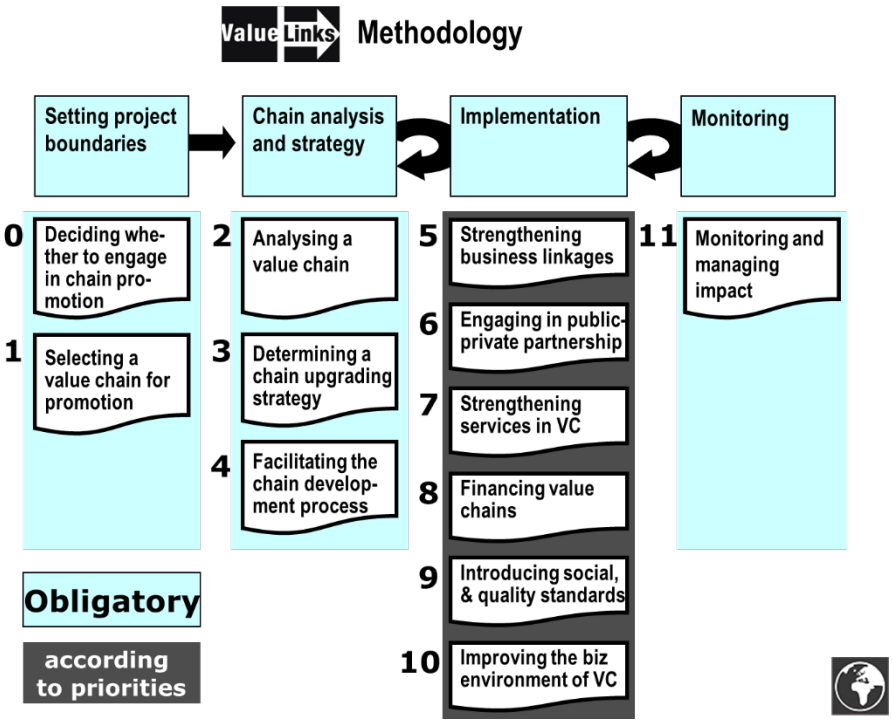

Figure 1: Structure of ValueLinks (SPRINGER-HEINZE 2018: ValueLinks 2.0)

GIZ can draw on extensive expertise and a wide range of tools in each of these fields as well as training materials and formats that can be flexibly applied and adapted to the prevailing conditions in a specific value chain.
Value Chain development is often combined with territorial approaches to economic development, such as rural development or local and regional economic development. The Value Chain approach can also be used as a component in programmes on natural resource management or private sector.

In Kenya, GIZ is working in the agricultural sector in different value chains, these include: sweet potato, potato and dairy value chain.

In the Nutrition-sensitive Potato Partnership Project (NuSePPP), GIZ together with partner from the public and private sector is following a value chain approach. NuSePPP focuses its intervention on different stages in the potato value chain:

1. Ensuring the availability of inputs especially seed potatoes for farmers, by promotion of apical stem-cutting technology for decentralized seed multiplication and supporting seed multipliers through technical advice and financial support

2. Support of small scale farmers by providing them structured training and enhancing the Government Extension Service. The training is broken down in 15 modules focusing from land preparation to harvesting and business skills.
3. Strengthening of producer groups through farmer organization and capacity building on group governance, proper financial record keeping, quality control i.e. sorting and grading, facilitation of Contractual Agreements between producer groups and Processors
4. Advising off-takers, e.g. processors on business model development, investment strategies and raw material sourcing strategies
5. Awareness creation among consumers on nutritious food preparation, food storage and hygiene measures through community nutrition dialogues on village level
6. Establishment of an enabling framework by supporting the process of policy development, sector coordination and information exchange between stakeholders

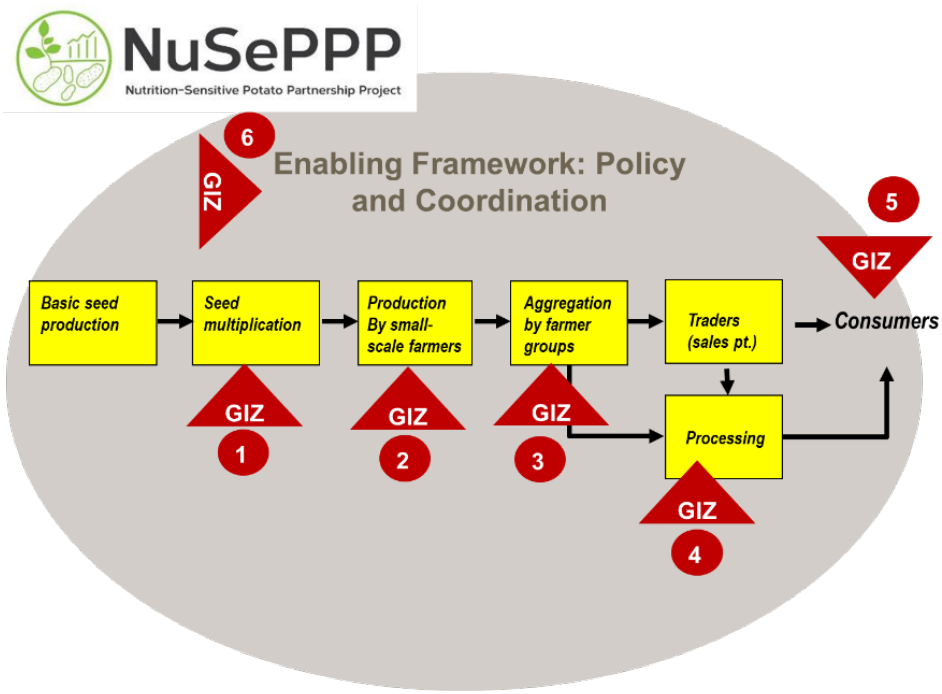

Figure 2: Value Chain approach of the Nutrition-Sensitive Potato Partnership Project (NuSePPP) (source: own draft)

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Business and Marketing Strategies in Smallholder Agriculture in Embu County

ARNE RIEBER / BENSON NYAGA

Picture 1-4: Smallholder Farming in Embu County (Arne Rieber 2018)

Introduction

Embu County is situated at the foot of Mt. Kenya. Due to the different altitudes, the county has three different agro ecological zones: The upper zone, known as the Tea zone, the middle zone or transitional zone and the Lower Zone. The zones create very different farming opportunities due to different temperatures, rainfall and in the case of the lower zone lower soil quality. Consequently the county is characterized by differing farming systems, cash-crop oriented in the upper zone and subsistence focused in the middle and lower zone. The here briefly presented study which was undertaken in 2018 was therefore narrowed down to one agri-ecological zone, the Middle Zone, which is ranging from 1200masl. to 1400masl.

The study included a qualitative research, working closely with 30 households and a quantitative household survey with a sample size of 104 households.

Business strategy

Two underlying factors influence the business strategy in the middle zone; climate and available land to a household. High population density and the division of land to the next generation have resulted in an average farm size of 2 acres (less than one hectare) in Embu County. The average owned land among the target households of the survey was even lower at 1.425 acre (0.85 ha) per household. The average cultivated land (=owned land + rented land + land borrowed – space required for housing and livestock) is 1.66 acre. The stratification in land ownership between households is strong. The median owned land is one acre with a median cultivated land of 1.5 acre showing the significance of rented land or cultivation of relatives' land in the area. The Middle Zone shows characteristics of both the upper and the lower zone, hence the name transition zone. The upper parts of the middle zone provide the opportunity to farm coffee; however the role of coffee is decreasing. The farming system is focused on subsistence farming, especially in terms of cultivated land. Maize and beans are the main crops and have dominated the farming system in the area for decades and cover most of the land, around 75%. Additionally farmers designate small areas for tubes, root crops, vegetables and fruits. The variety of crops is high as the drought-resistant crops known from the lower zone can also be cultivated in the middle zone. Under the FAO classification the area's farming system is a 'Maize Mixed Farming System' and "the whole system is currently in crisis as input use has fallen sharply due to the shortage of seed, fertiliser and agro-chemicals, plus the high price of fertiliser relative to the maize price" (DIXON et al. 2001). 17 years after the FAO publication the maize crisis is ongoing and adoption and coping strategies to the fall of the traditional maize system and market play a major role in the livelihood strategies. Livestock keeping is also central to the smallholder farming in the area, tethering of cows and goats is possible in most areas of the middle zone while zero-grazing is more common. In recent years khat has become one of the main income sources in the middle zone and has surpassed coffee as the cash-crop of the area. The large range of farming opportunities is reflected in the following typology of farm strategies in the middle zone which is divided in commercial and subsistence farming. It is important to note that all farms in the region show an integrated farming system, the following strategies have to be seen as a focus not the sole venture.

Commercialized livestock farming		**Commercialized crop farming**		
Stockbreeding	Dairy/Egg Farming	Mono-Cropping	Diversified farming	Cash-crop farming
Main income derives from livestock rearing. Crop farming serves mainly as provider of fodder and for subsistence	Main income derives from the regular sale of milk and/or eggs. Crop farming serves mainly as provider of fodder and for subsistence	Reliance on few food or fruit crops. Usually Maize and beans →low degree of following a specific strategy	Sale of many different crops and fruits at low quantities, keeping livestock for both subsistence and occasional sale of livestock	Option 1: Strong reliance on coffee or khat production. Option 2: Commercialized horticulture Food and Fruit Crops mainly for subsistence. Livestock for occasional sales and as provider of manure

Subsistence farming	
Diversified subsistence farming (Food Security)	Reliance on maize&beans as staple food
Farming aims primarily at raising the household's food security and diversifying the household diet. Livestock is kept for higher supply of manure and for improvements in the diet as well as asset in case of emergency	Farming aims at securing the necessary amount of maize and beans for the household. Occasional surpluses are sold. →low degree of following a specific strategy

Table 1: Farming Systems in Embu County (Data: Field Survey 2018)

In order to achieve a monetary income from the little land available the farmers are forced to either seek for wage labour or engage in high-profit ventures that can be undertaken on little land:

1. Dairy production and zero-grazing livestock keeping
2. Horticulture
3. Miraa/Khat

When looking at the three options the required investments differ strongly. Prices for milk cows are high and for many smallholder farmers not affordable and risky due to diseases. Commercial horticulture requires access to irrigation water. Water pumps, wells or ponds require investment capital which is hard to obtain. Consequently khat is increasingly popular among the smallholders. Around 60% of the respondents of the survey are active in khat farming and dedicate around 15% of their land to the khat bushes.

Miraa, or Khat, is a stimulant drug that is chewed and has light effects of euphoria. It is illegal in many regions of the world, e.g. in neighbouring Tanzania. In Kenya both cultivation and consumption is legal. The market for khat is dominated by middlemen who ship the product from the khat-growing regions to large markets in Nairobi, Mombasa, etc. As the productivity of the khat bush varies strongly with the rain seasons, the general productivity and therefore the price has extreme highs and lows. In the rainy season prices can drop to as low as 20KES per kg, in the dry season prices can go up to 1200KES per kg. Averages in the rainy season are between 100 to 200 KES and in the dry season anywhere between 400 and 800. Relatively small plots provide a regular income for the household which positively influences food security. When looking at the total farm income of the households that participated in the survey khat contributed 63.74%. Among the 59 khat farming households the khat income makes up for 75.49% of the farmincome and 52.47% of the total household income.

Picture 5: Duncan Chege on the farm's khat plot (Arne Rieber 2018)

It is not only the investment cost but also the overall profitability of khat that leads to higher engagement in khat production instead of horticulture. The khat income was in many cases used to reinvest in the khat farming, e.g. irrigation sources. Market access for khat is provided through middlemen. Due to the high competition in the khat business the farmers gain relatively strong negotiation power which leads to a balanced market.

Marketing strategies of horticultural produce

Smallholder farmers use different ways to market their products, very much depending on the market price and access to markets. Most farmers lack means of own transport and need to rely on motorbike taxis and public service vehicles to transport their produce to the markets. As soon as the cost of transportation exceeds the higher price that can be achieved by directly selling to market vendors, brokers or middlemen come into play. Especially on the fruit market the price per bag is too low to transport it to the market and still achieve a profit which is why mango, avocado, papaya and banana are mainly sold to middlemen.

The vegetable marketing is more complex. First of all, sales at the farm gate to people in the neighbourhood do play a role and provide occasional small profits directly from the farm. As the sale of vegetable is more profitable many farmers take the product to local or regional markets, depending on the demand by the vendors on the market.

Smallholder farmers usually do not personally sell on the market. The third way of selling is to brokers that are active in the region.

Table 2: Point of Sale (Data: Field Survey 2018)

Point of sale combined for food crops, vegetables and fruits (n=104)

	Number of households	Percentage of households
Direct sale to customers	52	50.00%
Broker/Middlemen	64	61.54%
Local produce market	25	24.04%
Regional produce market	37	53.58%
Sale to school (maize or beans in return for lower school fees)	5	4.81%

Conclusion

Agro-ecological zone and land constraints influence the business strategies of smallholder farmers in Embu County.

Smallholder farmer's participation on the fruit market is very low; the fruit production is aimed at subsistence. The return per acre from fruits is too low to designate the little land available to that venture.

The participation of smallholder farmers on the vegetable market is certainly higher compared to fruits. However high investment costs to set up a source of water for irrigation is challenging to the often resource poor farmers. On top, the overall profitability per acre is lower compared to the farming of khat and market access is challenging.

Khat therefore takes up land which could be utilized for food crops and fruits, directly influencing the supply of fruits and vegetables in the region. From a household perspective khat is a profitable venture with a regular income, supporting food security and in many cases supports the education of the children. Khat is the driver of an evolution of the prevalent farming system under land constraints in Embu County.

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Contribution from the practice - Kabete Organic Gardens

PATRICK NZIOKA ONZERE

Have learnt about farming at an early age, I grew up in a family that adored farming, through the guidance of my mother and mentorship that I have achieved this art of farming, however it's until three 3 years ago that I quit profession hustle in journalism and jumped into the murky waters of full time farming; organic farming of vegetables, herbs and spices.

Photos: Cultivation and products of *Kabete Organic Gardens* (Patrick Onzere 2018)

Kabete Organic Gardens – Continuation

Why organic farming because I wanted to be able to provide healthy, clean, nutritious and sweet food free from chemicals and synthetics fertilisers to myself and urban dwellers (Nairobi capital) thus bringing back the culture of clean and healthy eating lifestyle.

Organic farming is best crops, it reduces cost but increases quality of food, while organic vegetables are pricey, they provide numerous health benefits that make them worth the cost. All our products are sold either at the local organic markets, supermarkets, grocery's or on our facebook page *Kabete Organic Gardens* at a fair market price equal to regular vegetables or sometimes at a cheaper rate, too. This is because most don't have organic section in their fresh produce section. Hoping in the near future they will have one.

With the right farming methods we can increase the produce and make land more fertile. In our efforts to enhance the quality, quantity and food safety, we Kabete Organic Gardens have inducted organic farming methods by teaching and training other farmers and key players in this sector. Though it been lucrative it doesn't lack challenges like funding of the training , availability of clean water, availbility of land to lease but if we can get assist in any of this I am sure it will play a big role into transforming organic farming.

Retailing of fruits and vegetables in Machakos County, Peri-urban area of Nairobi Metropolitan Region

ALICE OLUOKO-ODINGO

Market Garden farming

A market garden is a farm or garden used for the production of crops for sale into the market. Farmers in Market Gardens produce for sale using a number of processes to enhance the efficiency of farm produce delivery to consumers (LIVINGSTONE 1958, WILLIAMS 1976). The market gardens provide small-scale urban and peri-urban farmers with opportunity to act as the producer, processor, distributor and final retailer. In cases where the market gardener cannot perform the four functions, there is the possibility of middlemen to connect the market gardener with the retail market (JASDANWALLA 1977). Once the produce reaches the market, the market farmer cum retailer is not obliged to specialize (FRENCH 1958), but may transact several wares-vegetables and fruits, cereals, fuel sources, clothing, and many others, mainly to overcome the rigid market structure and diversify the income base. According to FAO (2011), retailing is one of the important areas for development within developing world to promote and increase demand for small-scale agro-processing and peri-urban products as nearly two-thirds of the urban and peri-urban population engage in agriculture. Thus, securing market outlets is one of the important areas for development in urban and peri-urban food security.

Despite the many drivers to peri-urban retailing, peri-urban market farmer also faces a number of challenges (for instance, the producers and consumers often get a poor deal, while the middle men control the market; there is massive in stage determination in quality and frequent mismatch between demand and supply both spatially and temporally; lack of efficient marketing system and appropriate infrastructure results in large post-harvest loses (due to perishability of vegetables and fruits)); as well as lack of information about market demands, sudden shortages and prices (ROHIT et al. 2017), which require frequent innovation for sustainability in food security in urban and peri-urban areas.

Methodology

The main objective of the study was to examine the typologies of the various fruit and vegetable markets, their characteristics and the role of farm income and time and distance to market in influencing fruit and vegetables retiling in peri-urban areas of Nairobi City. Specific objectives were to:

- Identify the various market typologies and characteristics of such markets (the areas/regions producing such crops and their geographical dispersal in different locations as an approach to find out which one dominates the market, which could indicate the price and other benefits. For instance, is one market preferred more than the others (something that could indicate market inefficiency).
- Map out the spatial location of markets and factors determining the location of such markets
- Investigate the role of farm income in influencing the retailing of fruits and vegetables in the study area
- Study Time and Distance differentials regarding retailing of fruits and vegetables in the area.

Results and Findings

Market Typologies, Characteristics and Crops

Some of the marketing channels for urban and peri-urban products include: neighborhood markets (door-to-door distribution and community sales points), Institutional or commercial sales (products are sold to health and youth centres, schools, supermarkets and hotels, based on producer-consumer agreements, with organized fewer associations). Some of the interventions for securing markets include: stimulating consumer demand by highlighting the quality of origin of produce as well as the health benefits of diversified diet (including fruits and vegetables); developing opportunities for processed goods and in full compliance with rules for hygiene and quality standards; intervening at school level, with nutrition education in conjunction with school garden programmes to promote healthy diet. Open-air markets in peri-urban areas of Kenya are the most convenient sources for fruits and vegetables for many households (CHERONO & OTIENO 2016). A personal communication with FAO Programe Officer for Machakos County in 2017 emphasized that special focus should be paid to market-driven production (market gardens). He further recommended that crops should be vegetables and fruits that can be harvested throughout the year (for instance kales, spinach,

coriander, amaranthus and indigenous vegetables (most preferred by middle class)). Figure 1 and 2 show the location of various markets in Machakos County. Since most markets were located in Institutional Lands, it is important to ask 'what are the factors determining the location of market gardens?

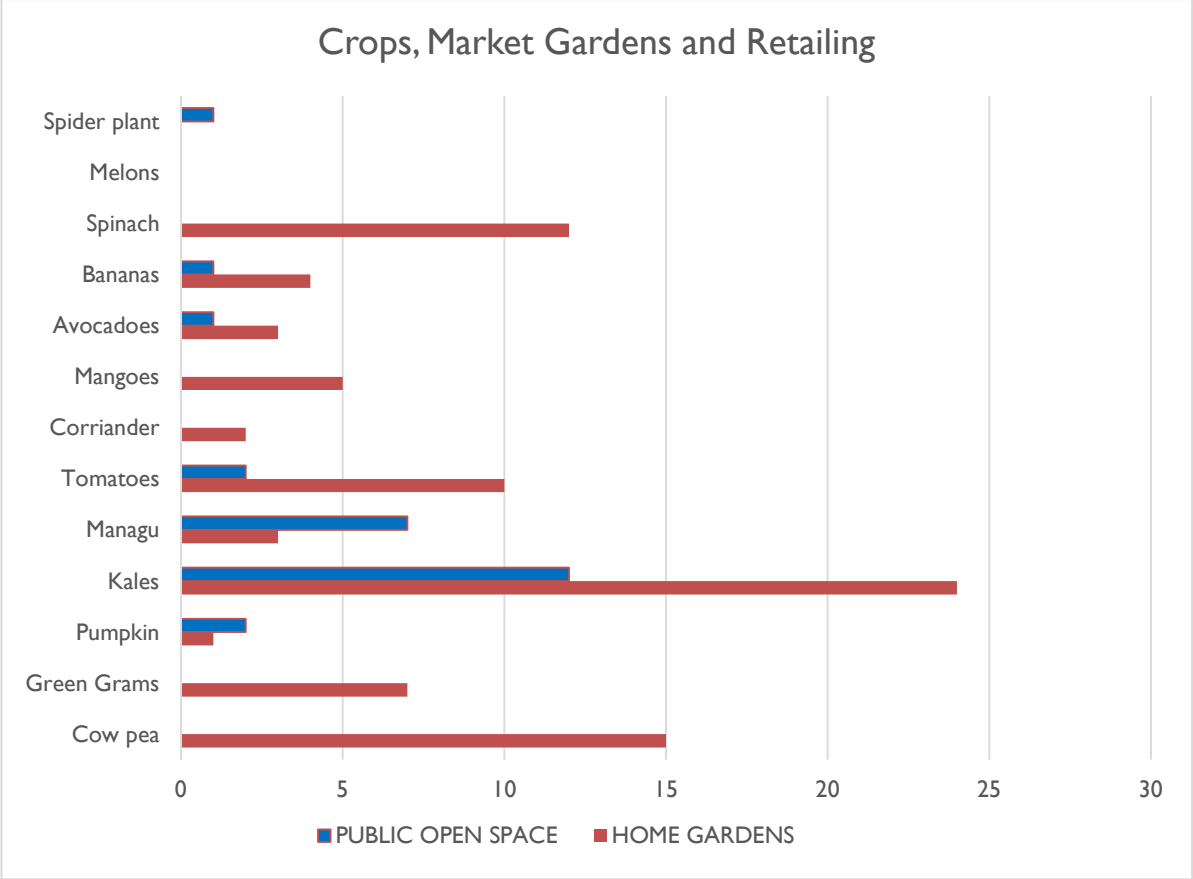

Figure 1: Crops, Market Gardens and Retailing (source: Field data)

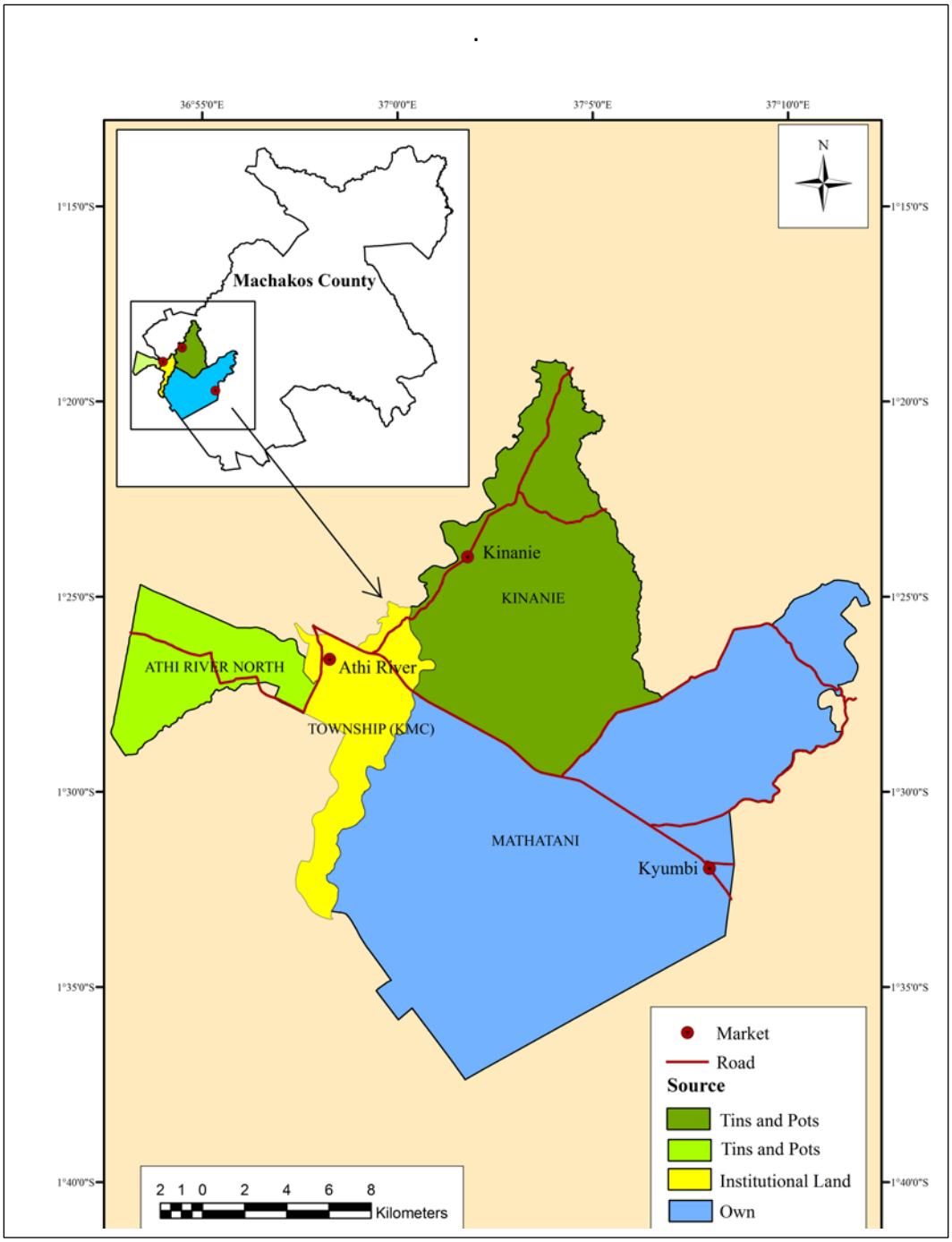

Figure 2: Typologies of Market gardens (source: Author)

Cow peas, onions, spider plant and tomatoes, Terere and Managu (indigenous vegetables) were also popular. Most vegetables traveled for less than 1km though for these popular crops, the distance is not an issue. The fruits and vegetables are located in market gardens mostly 10km to 20 km away and relatively few traders handle them. The position of Spinach and kales as the leading vegetable being retailed is interchangeable, followed by, then cabbage, cow peas, onions, spider plant and tomatoes.

Fruits and Vegetables Retailing versus Distance and Time

The fruits and vegetables travel/ retail at 0 to 20 km. A majority are within 2-5 Km and more than 20Km. The journey lasted from less than 10 minutes to over 2 hours (120 minutes). The fee ranging from Ksh. 20 to more than Ksh. 500, for instance, 70 percent of the retailers paid more than Ksh. 500 for transport. About 25 percent paid between Ksh. 200 and Ksh. 500. Markets located in Institutional lands (like the Kenya Meat Commission) were the most popular and retailers traveled from below 1 km to over 20Km.

Retailing, Crops, Time and Distance

The relationships in the between the Markets, Crops, Time and Distance, have been summarized by the Author in Figure 3 below as follows:

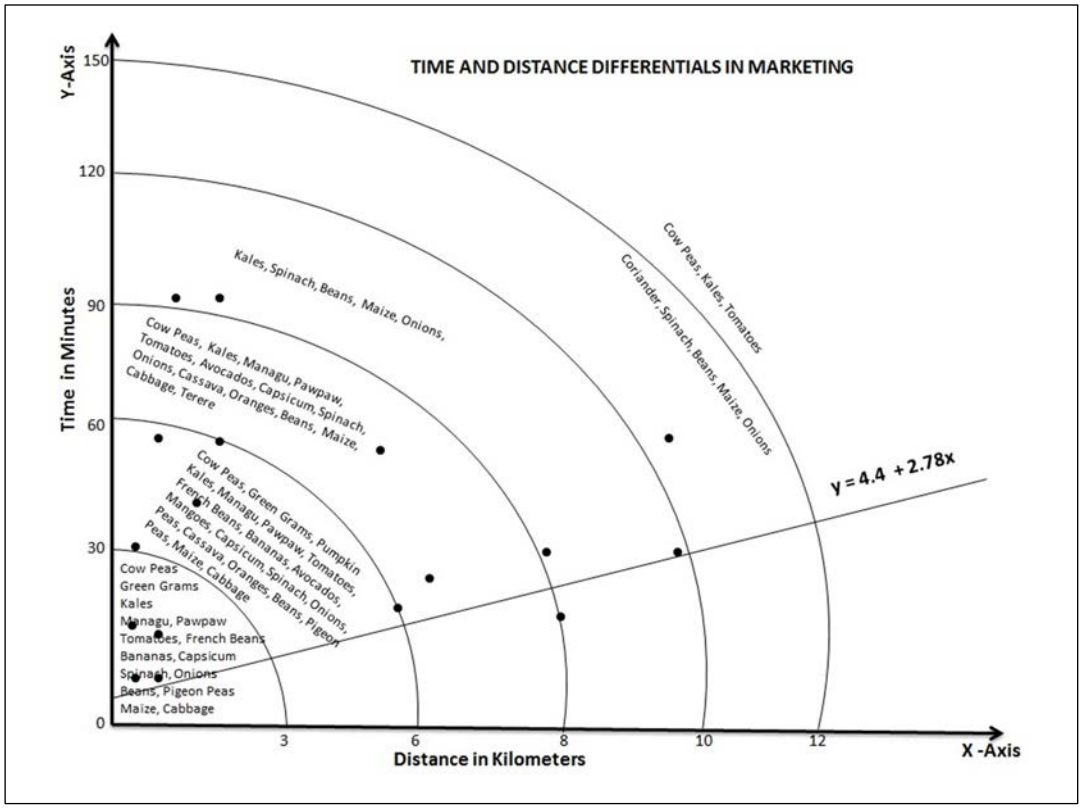

Figure 3: Relationship between Markets, Crops and Time and Distance Differentials in marketing (source: OLUOKO-ODINGO 2018)

According to OLUOKO-ODINGO (2018):

- Home gardens are the Primary retail contacts with peri-urban farmers due to their availability, accessibility and minimal time-Distance relationships;
- The number of Marketable crops (fruits, vegetables and cereals) decrease with increase in distance and time from the farm;
- The most popular/marketable crop travels the longest distance and to close proximity with the urban fringe market;
- The most marketable crops are sold irrespective of time-distance differentials, and;
- These time-distance relationships in crop marketing (fruits, vegetables and cereals) can be modeled in the algebraic equation: Y=a + bX, where Y represents time taken to reach the market, a is constant (4.44), b is regression coefficient (2.78) and X is the distance between the farm and the market.

These relationships are very important in the development of new crop varieties that would remain relevant for various markets irrespective of location. The model is also useful in management of post-harvest losses by determining appropriate/strategic locations for storage facilities, among other benefits. According to time-distance differentials, Kales was the most retailed crop, followed by spinach, then managu. Tomatoes, onions and cow peas scored the same, with the majority of the retailers having an income of less than Ksh. 25,000 per month. Retailing of fruits is less common than that of the vegetables.

Effects of Farm Income/Price on Retailing of fruits and vegetables

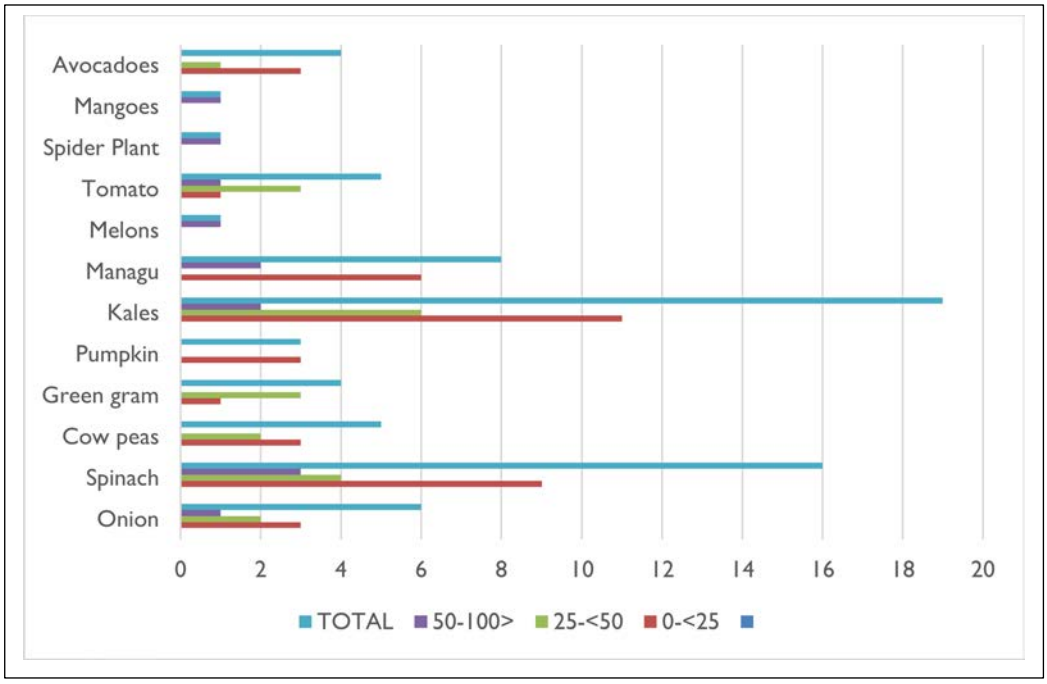

Figure 4: Retail of Crops versus Income (source: Field data)

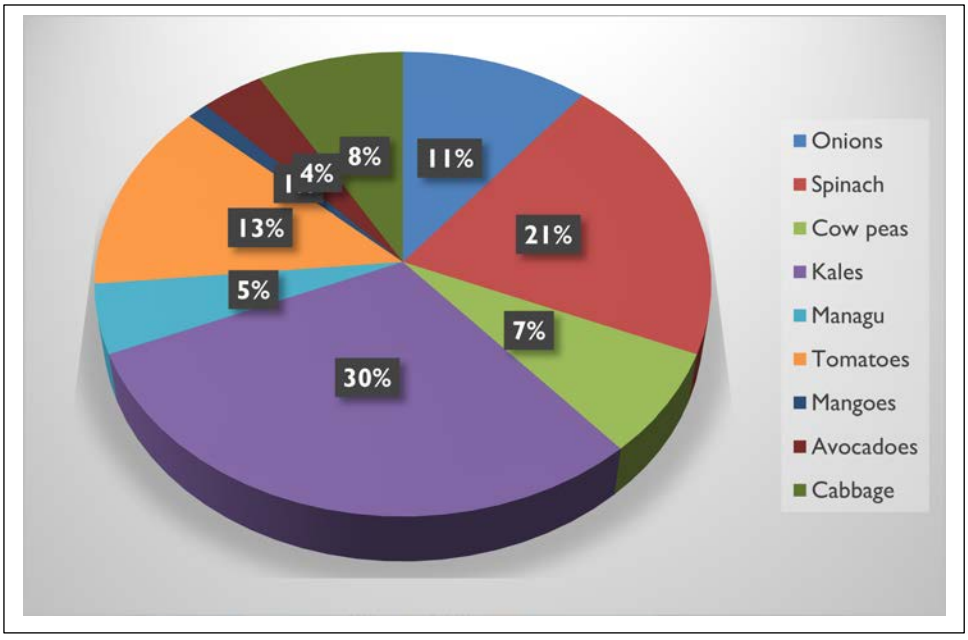

Figure 5: Retail Time Frequency (source: Field data)

Table 1: Success stories and lessons (source: Field data Interviews with Retailers)

Retailer	Success Story	Lesson
1	Has good customer relations, has the products needed by the clients, has permanent customers that can get credit and so the sales have been increasing	It is good to have good relationships with customers
2	Located next to a petrol station, and with good branding, the shop is visible. The need for fast foods is also high	It is important to have good customer services and make the working place visible. Also add more services like wifi, TV, etc
3	They have been able to open 9 new branches in different locations	The organization is popular
4	From a small shop, opened a bigger shop and then much bigger shop, bought a plot and now wants to buy own track for transport	Sale of produce is a good business and one needs to be patient and consistent
5	The farmer has been able to pay school fees and sustain her family	Selling produce is a profitable business
6	The trader has been able to furnish her house with household items	The business is paying
7	Being the only source of income, the business has provided for basic needs- food, clothing shelter and school fees	Purchase commodities when in plenty and store and the final returns are good
8	Started with 3 branches and now has 42 branches- has created employment. There is great increase in consumption of farm produce	The organization is popular, with great growth
9	The business is not as it used to be in the past when we had great profits. It is now bad due to political instability in the country	When politics is stable in the country, there is stability in business. Businesses collapse when there is no stability
10	The business has grown from small to a big store	Never despise your humble beginnings
11	The profit made has helped increase stock, feeding family, educating siblings in high school and colleges and universities. The business had enabled me lead a descent life	In business, one has to be optimistic. Apart from success sometimes one fails to reach his/her targets and this should not discourage one from pushing on.

Table 2: Constraints and Market Strategies (source: Field data Interviews with Retailers)

Retailer	Constraint	Facing the Challenge
1	Few customers, returns are low, poor working conditions during bad weather-sunny/rainy, people buy from vendors near home and not market	Transport cost is high, expand market, discourage suppliers from retailing products to safeguard traders in the market
2	Packaging bags	Improve on quality to attract customers, engage somebody to guard the produce
3	Price variation, sales go down depending on the season	-More farmers to engage in greenhouse production - Good storage facilities for perishables, selling products that are in high demand - Have quality products, diversify products for sale, only stock what consumers demand
4	Low turn up of customers, Suppliers fail to supply, Low prices due to competition	Required inputs and water supply to farmers is necessary. Transport costs to be reduced. More use of greenhouses
5	Transport during the rainy season	Purchase a lot of produce during harvesting and sell during low supply

Summary of findings and Conclusions

The study has shown that Market gardens in Machakos County include Public Open space, Home gardens, Institutional markets, Tins and Pots and Own farm, some being very small and require further study with respect to their profitability. Home gardens play a major role in peri-urban fruits and vegetables production, hence retailing, thus showing an important policy area. Location of markets is determined by time and distance to market, income from retailing and consistency in the supply of produce by market gardens. There is no specific specialization as many retailers tend to sell several products as was observed by JASDANWALLA (1977). Fruits and vegetables are retailed with other crops, mostly cereals in different markets, and this could be to allow: a) Income sources diversification and b) To deal with complex rigid structure of the market as observed by FRENCH (1958). The most retailed crops are affordable to both low and high income consumers. It is therefore possible to conclude that market farmers take

their produce to markets with best retail price. The selected crops are those that retail and provide the best returns, and the resultant price accommodates all the farmers' expenses within the best profit margin.

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Social-ecological resilience of agroindustrial food system in Northwest Mt. Kenya Region

STELLAH MIKALITSA MUKHOVI

Introduction

Kenya is one of the Countries in Africa that suffers from severe climate change impacts and associated disasters which have negative consequences to food systems and economy in general (FAO 2015). As these impacts intensify availability of production assets become increasingly difficult due population pressure, diminishing land resources, land degradation and competition over food production resources (especially land and water) by different actors (KITEME & WIESMANN 2015). As resources for food production dwindle, competition becomes prevalent resulting in resource use conflicts especially in Kenya (OPIYO et al. 2012). Both gradual/slow and rapid risks may affect the stability of ecological and social systems limiting the capacity of food systems to provide food security and wellbeing for those who depend on it as well as negatively affecting exports from horticulture sector which is a major source of foreign exchange. Generally, risks can be grouped into: natural disasters, resource scarcity and environmental variability (water scarcity, declining water quality, climate variability); social change (demographic change, migration, urbanization, health risks, economic crisis); institutional change (change of policies and legal frameworks); economic change (price fluctuation), political change (politically instigated conflicts) (PERZ et al. 2010; AUBIN et al. 2013; KECK & SAKDAPOLRAK 2013; IPES 2015; RIGOLOT et al. 2017) (Table 1).

Table 1: Socio-ecological Stressors of Food Systems (source: Adapted from KECK & SAKDAPOLRAK 2013)

Category	Examples
Natural hazards	Droughts, volcano eruptions, tsunami, fires and tropical storms.
Natural resource scarcity and environmental variability	Land degradation, climate variability and climate change, water scarcity, declining water quality, desertification
Social change and development issues	policy and institutional change, migration, infrastructural development, urban socio-spatial transformation, economic crisis and uncertainty, health risks, regional economic transformation

According to COLONNA et al. (2013), food systems "are interdependent networks of stakeholders (companies, financial institutions and public and private organizations), localized in a given geographical area (region, state, multinational region) participating directly or indirectly in the creation of flow of goods and services geared towards satisfying the food needs of one or more group of consumers, both locally and outside the area considered." There are several subsystems that make up food systems namely; political sub-system (institutions and laws both hard and soft that affect food production), information sub-system (access to information, logistical services, research, extension), operational sub-system (day to day activities that for example a farmer engages in to produce food) and natural sub-system (soils, water and energy) (ESNOUF et al. 2013; COLONNA et al. 2013; ROBERTO et al. 2014). In the study area, participatory mapping identified there main food systems, an agroindustrial food system based on horticulture mainly for export, a regional food system based on meat, dairy, wheat and barley value chains and a local food system comprising of smallholders producing mainly maize, beans and potatoes for subsistence and local markets. The concept of food systems has become important in the recent past because it allows an understanding of the complexity of food cycles as interaction between the biophysical and socio-cultural environments. Unlike the value chain approach that looks at activities (production, transportation, processing and consumption), a food system approach includes governance, food security and sustainability as important aspects. In addition,

food system approaches help us to understand competing priorities of actors and tradeoffs between food systems components (TENDAL et al. 2015).

Several studies have looked at factors that promote resilience against risks and disasters. They include; community connectedness (THORNLEY et al. 2015; BATCH et al. 2010), infrastructure (THORNLEY et al. 2015; HALLEGATTE 2009), support from government agencies (ADGER 2000a), governance (RIST et al. 2007), and social protection systems (HOLMES & BHUVANENDRA 2013). Other studies have looked at effects of globalization (WINKEL et al 2016), livelihood resilience (TANNER et al. 2015; IFEJIKA SPERANZA et al. 2014) and food sovereignty (SAGE 2014). This study looked at three dimensions of resilience namely buffer capacity, self-organisation and learning and adaptation in the context of agroindustrial food system and how it compares with other food systems in the same region. Although resilience has been well studied in natural ecosystems such as coral reefs and forests (NYSTROM et al. 2000; CHAPIN 2004), it has not been widely used in food systems. Agroecosystems are as dynamic as natural systems hence the importance of resilience also as a way of cushioning actors against risks and maintaining provision of supplies of food, fodder and fibre, as well as incomes of rural communities.

The study employed the food system resilience action cycle (TENDALL et al. 2015) (Figure 1). The Cycle considers the fact that resilience is not a onetime event to deal with one time shock but rather a process that consists of reactive actions (absorb, react, restore, and learn) and preventive actions (build robustness). Preventive actions help build capacity of food systems to deal with future shocks while while reactive actions are more short term actions geared towards coping against shocks. Each action is enabled by a capacity of the food system to absorb, build robustness, restore and learning (TENDALL et al. 2015). The framework shows that it is not possible for a food system to reach an optimal or perfect state but rather there is continuous improvement on the system and sometimes very robust food systems may also become vulnerable as new threats emerge.

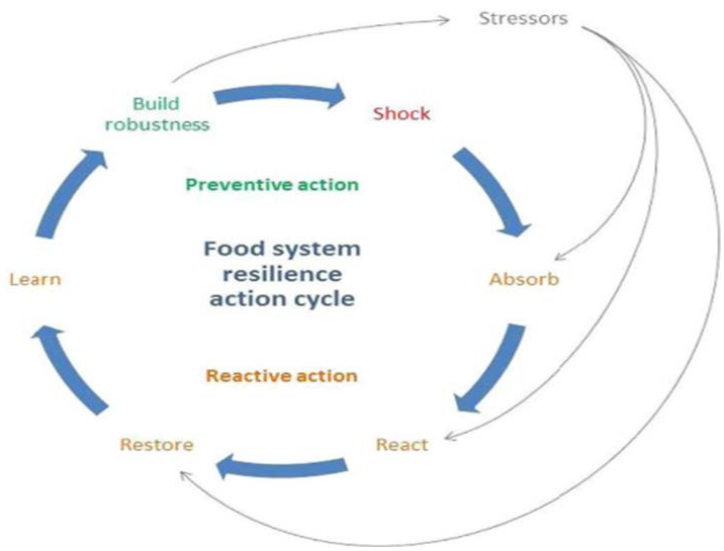

Figure 1: Resilience Framework (source: TENDALL et al. 2015)

Food systems in Kenya like many parts of the world are affected by a myriad of risks that necessitate efforts to build resilience through accumulation of livelihood assets (buffer capacity), self–organization, and learning and adaptation-often referred to as resilience dimensions in the literature (IFEJIKA SPERANZA et al. 2014). Sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised (FAO-UNEP 2014). Food systems are sustainable if they withstand, cope with and recover quickly from risks and shocks, but also contribute to food security and reduction of poverty and inequality, and negative environmental impacts. In this research, social-ecological resilience is one of five pillars of food sustainability. Others include; reduction of poverty and inequality, food security, right to food and environmental performance (Figure 2). Social-ecological resilience has become an important indicator for food sustainability due to increasing susceptibility of the food systems to a myriad of risks including global environmental change (ERICKSEN 2008; IPCC 2007; FAO 2011). In addition, a resilience approach allows us to identify risks facing food systems, the complex interactions between ecological and social systems hence we contribute necessary information for developing policies on learning and adaptation (SAGE 2014).

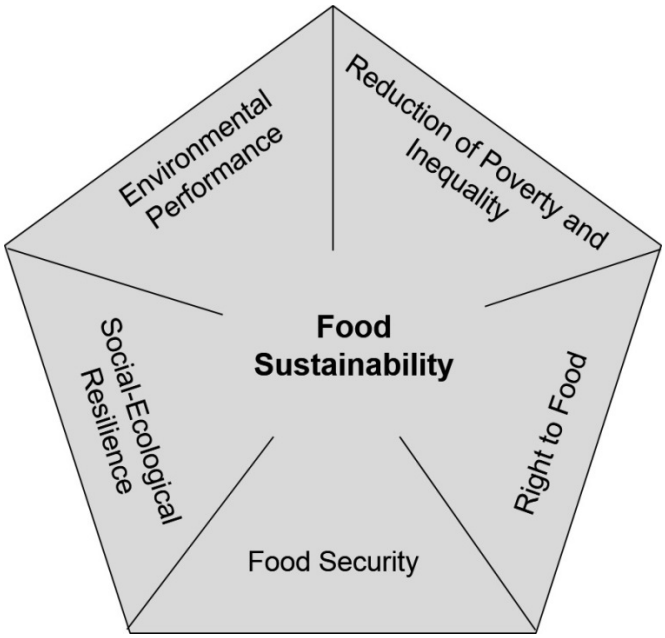

Figure 2: Pillars of food sustainability (source: RIST et al. 2016)

The agroindustrial food system in Kenya produces vegetables for export mainly, runner beans, tender stem broccoli, sugar snaps, garden peas, fine beans/French beans and snow peas. The shocks that face this food system include water shortages, droughts, climate variability and change, strict export market standards, pests and diseases, price fluctuation associated with fluctuating currency values among others. This food system comprises both commercial companies and smallholder outgrowers who are contracted to produce vegetables for export. The outgrowers and independent smallholders producing for export face a myriad of challenges including limited farm size limitation of 2-3 acres (URLICH 2014) within which they have different enterprises such as dairying, cash crop, food crops cultivation, horticulture production and aquaculture) on small holding. The outgrowers also face challenges in terms of technology, logistics (storage facilities, parkhouses, transportation and general limited infrastructure. There are challenges related to capacity to meet Minimum Residue Levels, frequent droughts, high cost of labour and limited extension service.

Materials and Methods

The study was carried out in Northwest Mt. Kenya region, which is located on 00 7'North and latitudes 370 40' East. Groups of at different stages of food systems parts of Laikipia and Meru were included in the study (Figure 3). All these areas are drained by River Ewaso Ngiro North. Participatory mapping during reconnaissance identified three food systems in Kenya; agroindustrial based on horticulture (K1), regional based on milk, beef, wheat and barley (K2), local food system comprising smallholder farmers (K3) (Table 2). The food systems were defined following COLONNA et al. (2013).

The rainfall patterns in the area under study in Kenya (Figure 2) is largely influenced by its proximity to Mount Kenya where rainfall drastically reduces as one moves away from the mountain. The rainfall is highly variable and ranges between 400mm-2500mm per annum, its largely bimodal with long rains between March-May and short rains October -December (NEMA 2013). The population density varies with agro-ecological zone from 42 persons (Laikipia County) per square kilometer to 320 persons per square kilometer (Meru County).

Data was collected by interviewing 5 managers of horticultural farms, Key informant interviews involving National and County government officials dealing with resilient building and NGOs, Focus Group Discussion (FGD) was conducted with a women group bordering a horticulture farm, Other data came from interviews with five managers of horticultural farms More information through interviews was obtained from transporters and supermarkets.

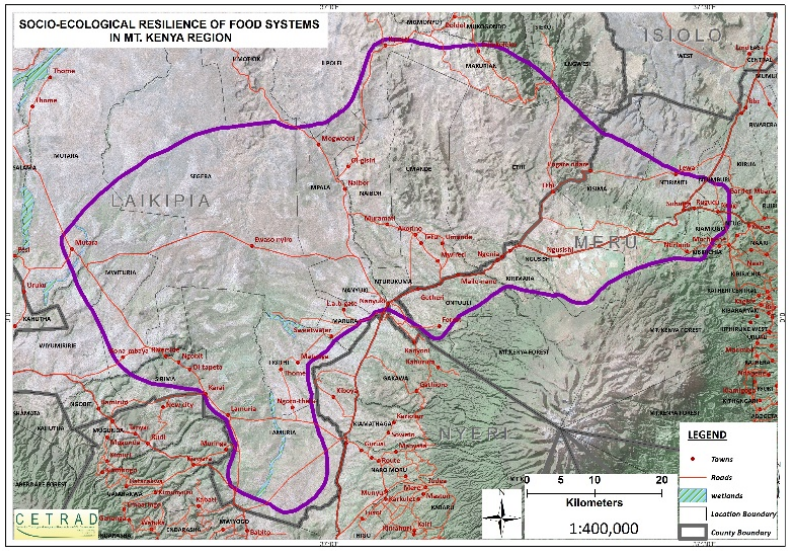

Figure 3: Map of the study area (source: own map)

Table 2: Food Systems (source: own research)

Food systems	Characteristics
Agro-industrial (K1*) horticulture	Production of vegetables for export to European markets
Regional (K2) Beef, milk, wheat	Products sold beyond county boundaries Beef produced by ranches and pastoralists and to a small extent smallholders Milk largely produced by smallholders Wheat largely produced by large scale farmers and smallholders
Local food system (K3) smallholders farmers and local markets	Smallholders (maize, potatoes and beans) Products consumed at household level and surplus to local market

*The study was done in two countries Kenya and Bolivia hence K stands for Kenya and the results presented in this study is for the agroindustrial food system in Kenya

Results

Figure 4 shows resilience indicators rated for three different food systems in Kenya from 0 (null) to 4 (very high). The agroindustrial got high scores in functioning feedback mechanisms, knowledge of threats and opportunities, interest groups and physical capital. Lowest scores were obtained in diversity of crops, local consumption of food products and use of local and indigenous knowledge.

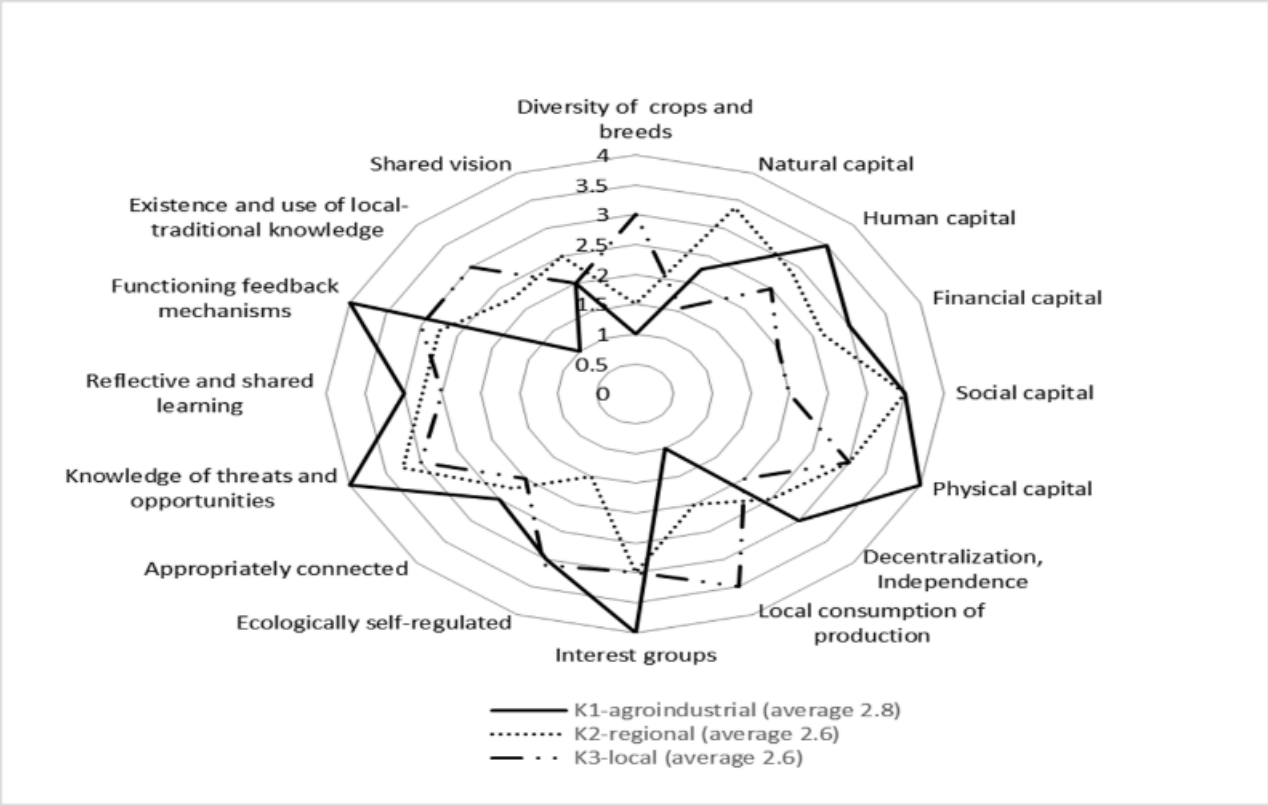

Figure 4: Resilience indicators rated for three different food systems in Kenya from 0 (null) to 4 (very high) (source: own research)

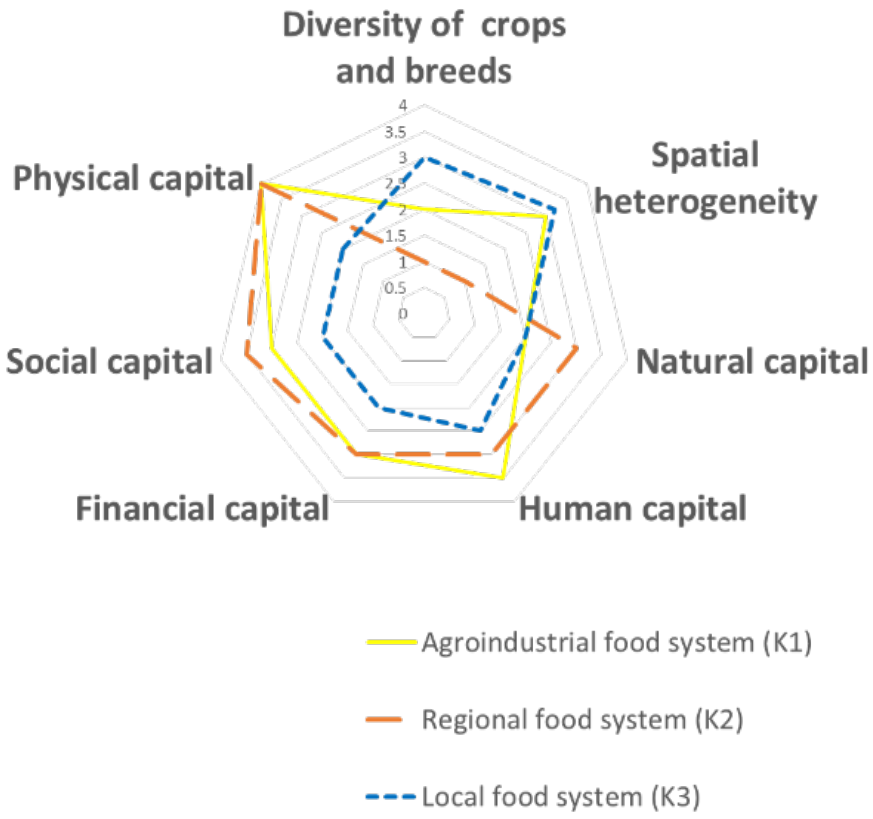

Figure 5: Buffer Capacity of agroindustrial food system compared with other food systems (source: own research)

With regard to buffer capacity (Figure 5), agroindustrial food system had the highest score of 2.9. The food system performed very well in financial capital although medium scores were identified regarding wage levels which were relatively low (KES 6,780/USD 66 for skilled workers; KES 5,436/USD 53 for unskilled workers). However a study by Urlich (2014) observed that although the wages in this food system were low, there was significant contribution to livelihoods in a region where alternative employment opportunities were limited. Accompanying study among smallholders showed that in 5% of the 600 local households interviewed, at least one household member had worked on a horticultural farm in the previous 12 months; and in another 12% of households, at least one household member had worked as an outgrower. Additionally, only 32% of the profit from this food system was captured locally while the retailers in the global North captured 68% of the profit generated along the value chain for exported green beans (TEUSCHER 2017). Although the agroindustrial food system had high access to land and water resources, it had the highest carbon footprint due to

intensive use of agrochemicals. Additionally intensive irrigation of vegetables contributed o high water abstraction and the downstream dwellers often blamed this food system and floriculture to low water supply.

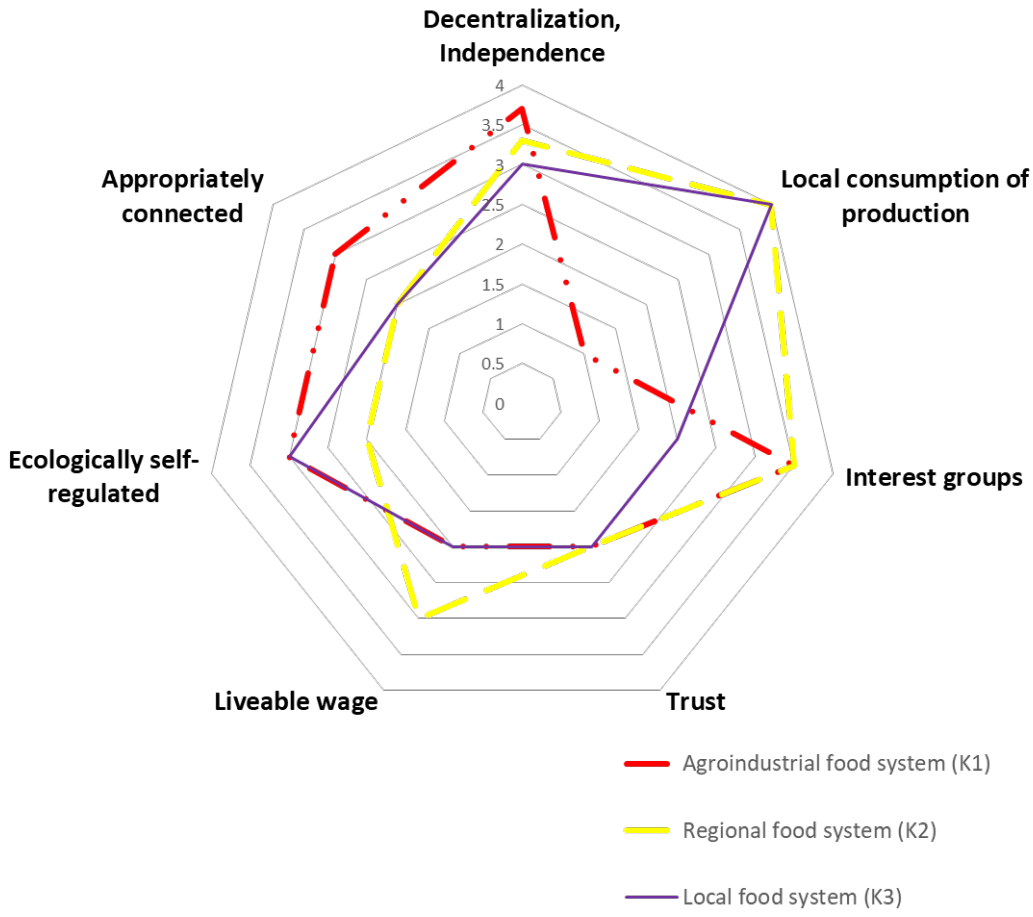

Figure 6: Self organization of agroindustrial food system compared with other food systems (source: own research)

Several indicators were used to measure self –organisation (Figure 6). According to the level of interaction/cooperation among actors, we found that actors in the agroindustrial food system were the most socially self-organised, while those of the local food system were the least socially self-organised. The actors in horticulture have their own network and label representing growers, exporters and service providers, the Fresh Produce Exporters Association of Kenya (FPEAK) and subscribe to other standards including GlobalGAP, Fair for Life, EurepGAP, or MPS (MAUSCHA et al. 2006). These standards guarantees safe production of vegetables, help build consumer confidence, safeguard the market, improve quality of products, enhance workers safety and welfare, protect the environment and promote good agricultural practices (MINOT AND NGIGI 2003). Additionally, agroindustrial food system performed well in

decentralization and independence since there was direct linkages between the food system and supermarkets especially in Europe and the input sources were quite diversified. The study observed that there was exchange of labour and technology between the agroindustrial and local food systems. The majority of the workers in the agroindustrial food system are smallholders within the region, but there are also migrants from other parts of the country. The most important technology transferred was greenhouse farming and drip irrigation. However poor performance (low scores) were obtained in social capital related to bargaining power of farm workers and small-scale outgrower farmers. Low scores were also seen in local consumption of vegetables from agroindustrial food systems due to its focus on production of non-traditional crops such as broccoli hence contribution to local food security low. On the other hand, landscape diversity on horticultural farms was high, since relatively small spaces were used intensively. The agroindustrial food system scored highly regarding interest groups (JACOBI et al. 2018).

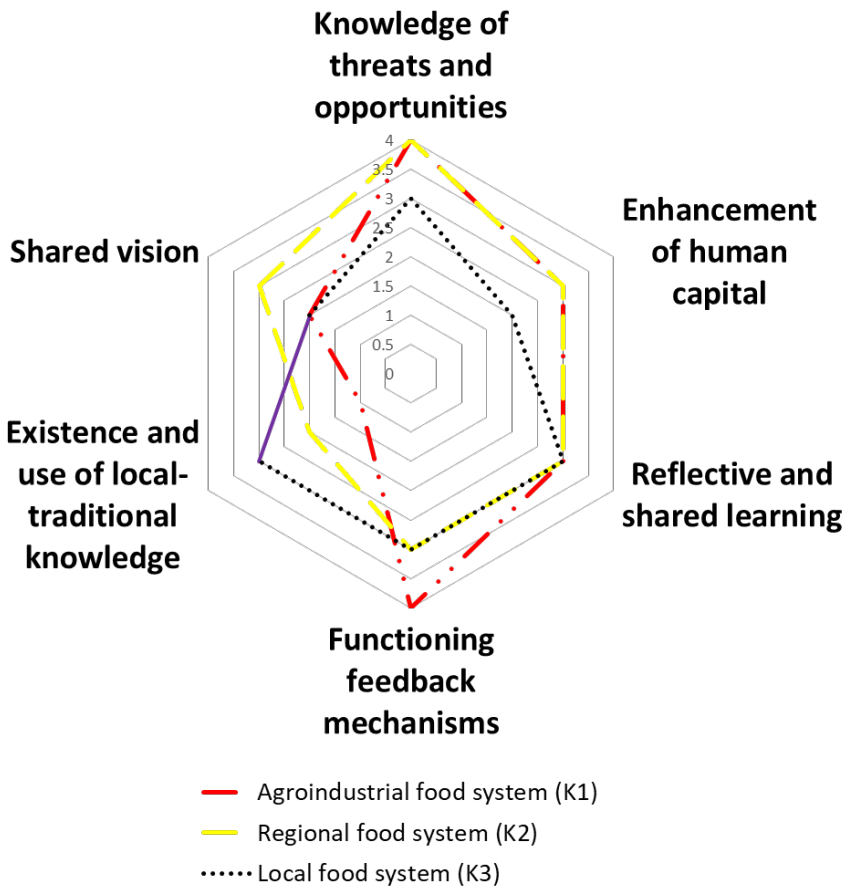

Figure 7: Capacity for learning and adaptation of agroindustrial food system compared with other food systems (source: own research)

One of the most important indicators of resilience is the capacity to learn and adapt to changes. According to OSBAHR (2007), successful adaptation is a learned process in which there is some form of communication through which information is passed. Actors in food systems may learn from past mistakes and make informed decisions to deal with future risks (ADGER 2000b; BERKES et al. 2003). Learning means taking stock of past, present and potential risks; getting the right information, reflecting and innovating practices and making decisions that reduce potential harm of risks (TSCHEKERT AND DIETRICH 2010). Actors learn indigenous/local knowledge through interaction with elders who pass on a wide range of knowledge including farming methods, weather dynamics, management of pests and diseases, food preservation and processing among others. The other form of knowledge is scientific and often learned through mass media (radio, television, print), internet and extension services. This kind of knowledge is more technical and is applied using certain procedures for instance use of chemicals, seeds, machinery among others. The agroindustrial food system got highest individual indicator scores for knowledge of threats and opportunities and functioning feedback mechanisms (Figure 7). Several workshops were organized especially with regard to use of agrochemicals to wage workers. For senior staff there was continuous upgrading of skills. The single lowest score in agroindustrial food system was lack of existence and use of local-traditional knowledge (BERKES et al. 2000) and production of crops largely for external markets. Reflective and shared learning was highest in agroindustrial food system due to high numbers of workshops.

Conclusion

The food system resilience approach has a high potential to help cope with the shocks and uncertainty facing food systems through building system robustness (buffer capacity), self-organisation among actors, diversification of food system landscapes, products, inputs and markets, and continuous learning, The agroindustrial food system will continue to face risks hence acquiring knowledge of current and emerging risks and opportunities to build resilience is crucial to ensure sustainability. The results show that the smallholder farmers producing vegetables for export were at higher risks due to limited capacities in terms of technology and access to information. There is need to provide incentives for learning and exchange of skills between the companies and smallholders. Additionally the global value chain faces challenges due to price fluctuation the need to diversify markets and products in order to take advantage of the

local supermarkets where the demand is growing within the major cities. There is need to enhance the resilience of wage labourers by ensuring provision of livable wages and putting in place infrastructure for self-organisation as a way of cushioning them against risks. The high intensity and frequency of risks – especially those associated with climate change requires innovation towards disaster risk reduction and scaling up of adaptation strategies that are already being implemented.

Acknowledgements

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Contribution from the practice - Fig Tree Market, Nairobi

SALOME KANIU

I just want to introduce our market that is Fig Tree Market which is located at Ngara in Nairobi. Fig Tree Market started in December 2004. It is an open air market which consists of all kinds of fruits and vegetables from all over the world. We do have daily supplies so we do sell all fresh and we concentrate on organic produces. We serve all sorts of consumers like foreigners (Embassies, United Nation workers, Government Officials) and local Kenyans. Some traders here rent their shops at 3000 KSh per month and others own them. Some produce we buy straight from the farmers and others we buy in a traders market called Marigiti or Wakulima market and Muthurwa market. About imports we buy at Highridge straight from the import company.

Photo: Shop booth (Salome Kaniu 2018)

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