Governance modes, collective organisation and external facilitators’ interventions in vegetable value chains in Northern Tanzania

Author(s):
Zoss, Marc

Publication Date:
2014

Permanent Link:
https://doi.org/10.3929/ethz-a-010346638

Rights / License:
In Copyright - Non-Commercial Use Permitted
Governance modes, collective organisation and external facilitators’ interventions in vegetable value chains in Northern Tanzania

A thesis submitted to attain the degree of

Doctor of Sciences of ETH Zurich
(Dr. sc. ETH Zurich)

Presented by

Marc Zoss
Master of Science in Geography, University of Berne, Switzerland
born on 21 July 1975
Citizen of Bolligen BE, Switzerland

Accepted on the recommendation of

Prof. Dr. Stefanie Engel, examiner
Prof. Dr. Bernard Lehmann, co-examiner
Dr. Dominique Barjolle, co-examiner

2014
Summary

High-value agriculture is the fastest growing agricultural sector. Typical high-value agricultural products include fish, meat and dairy products, as well as vegetables. As opposed to traditional commodities, these products have relatively high unit values and a high income-elasticity of demand. In addition, they are rather labour-intensive, require high food safety and quality specifications, and are typically integrated in well-coordinated value chains.

The rapidly increasing demand for high-value products, in particular vegetables, is stimulated by altered consumer preferences and growing health awareness both at the global level and in developing countries. In developing countries, the demand for high-quality vegetable produce is fostered by the rapid urbanisation and the emergence of a middle-class of relative wealth. Smallholder producers participating in these value chains may benefit from income and employment opportunities, particularly for the predominantly female farm workers. Consumers may get health benefits from safe and healthy vegetable supply. Interventions in value chains of high value agricultural products have become popular among development agencies, mostly focussing on single global value chains or export-oriented value chains.

The present thesis aims at analysing the implications of the evolving global food system on the smallholder producers. As a case study the vegetable sector with all its existing value chains in Northern Tanzania is used. The thesis develops a typology of value chains and their governance modes, analyses the profitability and their determinants of the value chains’ producers, and assesses the interventions of external facilitators in the value chains.

A combination of qualitative and quantitative methods was used to obtain the results. First an initial value chain appraisal was conducted to identify the value chains in the study. Each of the value chains was further studied with qualitative tools. The centrepiece of the quantitative work is a producer survey with 142 vegetable producers and was complemented with a price monitoring at four different wholesale and retail market places. The facilitators’ interventions are analysed mainly based upon guided interviews, focus group discussions, and field observation.

The typology of vegetable value chains comprises (i) rural and urban green markets, (ii) seed production, (iii) processed vegetables, (iv) institutional buyers and tourism, and (iv) fresh vegetable export value chains. In terms of value chain governance there is a continuum between the two extreme cases, the green markets with their spot-market arrangements and the fresh vegetable exports with an almost hierarchic governance form. In between there are various hybrid governance forms like processing (trust-based), seed production (relational network), and institutional buyers and tourism (leadership). The research suggests the governance forms moves from market to hierarchy with increasing
product quality reliability and the more complex governance forms reward the producers with decreasing price volatility.

Vegetable production and marketing is generally profitable for smallholder producers. The average relative gross margin of the producers was 72%. The regression analysis established that the type value chain, in which the producer participates, is the most important predictor for the gross margin. The analysis showed that the farm size is not principal determinant of the gross margin. The correlation analysis between the capital endowment and the value chain type integration show that producers in sophisticated value chains are significantly better equipped with natural and financial capital, the correlations with human and social capital are also positive but not significant. Our research suggests that the producers, which participate exclusively in the green market, are clearly distinct from those who are (also) integrated in the coordinated value chain types. Collective organization of smallholder producers has shown to be a firm requirement for participation in coordinated value chains but producers. The success factors of collective producer organisations are a clear focus on a viable business case, close cooperation with the private sector, sound management capabilities, an entrepreneurial and innovative mindset of key individuals, and a high degree of flexibility to the members.

The facilitators’ interventions are focussed on the producer level and the services provided include (i) provision of management training or infrastructure for producers, (ii) provision or subsidising of agricultural inputs, (iii) production support, (iv) organisation and/or strengthening of producer groups, (v) improvement of management capacity of producer group, (vi) provision of certification for good agricultural practices. Interventions targeting other value chain actors than the producer or targeting the enabling environment are clearly less frequently. Any interventions targeting the enabling environment were conducted by facilitators with large budgets and long project durations. The research suggests that creating an enabling environment should be a clear policy objective of facilitators and thus their interventions should not be confined to direct service provision at the producer level but include all stakeholders in the value chain and the enabling environment.
Zusammenfassung


die Governanceform sich mit zunehmender Produktqualitätserfordernissen von Markt zu Hierarchie verschiebt, sowie die Produzenten mit einer abnehmenden Absatzpreisvolatilität belohnt.


# Table of contents

Summary ........................................................................................................................................... i

Zusammenfassung .............................................................................................................................. iii

Table of contents ............................................................................................................................... v

General introduction .......................................................................................................................... 1

1. Presentation of context .................................................................................................................. 1
2. Theoretical background ............................................................................................................... 4
3. Research objectives and research design ..................................................................................... 10

Findings part 1: Typology of vegetable value chains ...................................................................... 15

1. Introduction .................................................................................................................................. 15
2. Theoretical background ............................................................................................................... 16
3. Methods ....................................................................................................................................... 18
4. Results ......................................................................................................................................... 20
5. Interpretation ............................................................................................................................... 49

Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains ........................................................................................................................................ 57

1. Introduction .................................................................................................................................. 57
2. Theoretical background ............................................................................................................... 59
3. Methods ....................................................................................................................................... 59
4. Results ......................................................................................................................................... 62
5. Interpretation ............................................................................................................................... 78

Findings part 3: Facilitator’s interventions ..................................................................................... 88

1. Introduction .................................................................................................................................. 88
2. Theoretical background ............................................................................................................... 89
3. Methods ....................................................................................................................................... 91
4. Results ......................................................................................................................................... 92
5. Interpretation ............................................................................................................................... 102
<table>
<thead>
<tr>
<th>Discussion</th>
<th>107</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of findings and conclusions</td>
<td>107</td>
</tr>
<tr>
<td>2. Development-oriented recommendations</td>
<td>112</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Annexes</th>
<th>115</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. References</td>
<td>115</td>
</tr>
<tr>
<td>2. Abbreviations</td>
<td>122</td>
</tr>
<tr>
<td>3. List of tables</td>
<td>123</td>
</tr>
<tr>
<td>4. List of figures</td>
<td>124</td>
</tr>
<tr>
<td>5. List of Vegetables</td>
<td>125</td>
</tr>
<tr>
<td>6. Producer survey</td>
<td>126</td>
</tr>
<tr>
<td>7. Green market survey: Wholesale and retail transactions</td>
<td>130</td>
</tr>
</tbody>
</table>

Acknowledgments | 132 |
General introduction

The present first chapter sets the scene for the research’s context, the context is presented, the theoretical background explained and the research interest and methodology outlined. Each of the proceeding result sections (Findings 1-3) is written as a stand-alone chapter including the pertinent literature and research methods in detail. Thus, the introduction only addresses the background and selected basic concepts; further details are comprehended in the specific finding sections.

In the general introduction first the context of the study is given followed by the theoretical background relevant for the whole study.

1. Presentation of context

1.1. Agriculture in Sub-Saharan Africa

The importance of agriculture in Sub-Saharan Africa is hardly to be underestimated. Even today, agriculture employs 65% of the African labour force and accounts for 32% of the GDP (World Bank 2013). Agricultural GDP growth in sub-Saharan Africa has accelerated from 2.3 percent per year in the 1980s to 3.8 percent per year from 2005 to 2010 (FAO 2013). Growth has been mostly based on area expansion, but suitable agricultural land is scarce and many countries are facing limits to further expansion. Agricultural productivity in Sub-Saharan Africa is among the lowest in the world.

The low use of fertilizer in Sub-Saharan Africa is well known (Morris et al. 2007). Thus, many governments have initialised fertiliser subsidy programmes with varied success which highly depends on the modalities of the schemes (Jayne & Rashid 2013). Yet, the fact that low level of fertiliser application in Sub-Saharan Africa continues to be a major hindrance to agricultural productivity remains.

Due to the high population pressure, the average farm size in Sub-Saharan Africa has been shrinking, the fallow periods shortened, and the soil fertility has decreased (Otsuka & Place 2014).

1.2. Horticulture and development: The case of high value agriculture

The term high value agriculture is used as a “catch-them-all” term and its meaning and what is included in high-value products is less clear. The World Development Report 2008 has prominently featured high-value agriculture in its “Agriculture for Development” report (World Bank 2008) but lacking any clear definition. The world development report contrasts high-value markets with food staple markets and traditional bulk exports. The agricultural products comprehended in the high value segments are:
Horticultural products (fruits and vegetables), fish and fish products, meat, nuts, spices and floriculture. A nexus between "non-traditional export products" (opposed to traditional or bulk exports (like coffee, cotton, cacao, etc.) and high-value is made.

In the early work of Jaffee (Jaffee & Gordon 1993) it is argued briefly that high value agricultural products have "considerably higher unit values and face much higher income elasticities of demand" than traditional staple crops (food grains, legumes, roots and tubers). The following products are considered high value: meat, dairy products, fish products, edible horticultural products, feedstuffs, and oilseeds. It is cited that in industrialised market economies the income elasticities for cereals is -0.22, while meat, eggs, fruits and vegetables lie between 0.25 and 0.38. For developing countries cereals are estimated at +0.16 and high value products between +0.61 and +1.00.

Regarding income elasticities of demand Ruel et al. (2004) have found in their cross-country comparison, elasticities for fruits and vegetables are in all countries lower than 1 and range between 0.60 and 0.97, and in most countries the YED of fruits is higher than the ones of vegetables.

Mergenthaler (2009) has assessed the elasticities of demand for income of vegetables and found that demand for products from modern value chains, particularly from supermarkets and non-traditional imports, is highly income elastic.

Temu & Temu (2006) state a lack of a coherent definition of high value products. The term "high value" mainly refers to the higher market values these products get compared to traditional cereal grains and exports.

Thus the two constitutional characteristics of high value product are their relatively high unit values or unit market prices, and their high income elasticities of demand.

In the literature high-value products are often contrasted with traditional foodstuffs or traditional exports. The distinctiveness between traditional agricultural products and high-value products may refer to the following dimensions. High-value products are often neither comprised in the traditional diets nor included in the traditional farming systems. In terms of marketing, high-value products are often integrated into new organisational arrangements within the value chains, such as closely coordinated value chains with overall a higher degree of vertical integration. Those value chains are often highly consumer-led and private agri-business enterprises are key actors. New product characteristics such as product quality attributes and private standards are a further distinctive feature of high value products which requires a so-called de-commodification which means that by grading and specific processing distinctive products are obtained.

In the following the term “high value agricultural products” is used to distinguish new, or non-traditional agricultural products from traditional agricultural products like (cereals, maize and other basic commodities). High value agricultural products have relatively high unit value and a high income elasticity of demand.

More importantly the value chains of the high value products differ from traditional agricultural products. This process can be named de-commoditification and is characterised by (i) a consumer-led demand, (ii) product differentiation, and (iii) complex supply chain organisations with high private-sector involvement. The product typically included are vegetables, fruits and other horticultural products, ornamental flowers.
1.3. **Production and marketing of vegetables in Tanzania**

Most of the studies on smallholder participation in export-oriented and high-value African horticulture are rooted in the specific Kenyan or to a lesser degree to the Ghanaian context (Battisti et al. 2009). Minot and Ngigi (2004) conclude that this business model could be replicated elsewhere, if specific factors were fulfilled. Besides the agro-ecological conditions, which are similar in Tanzania, other factors like economical stability, reliable access to transportation, and an environment conducive for business development are far more difficult to achieve. A large body of literature on global horticultural value chains is based on the agricultural production standards (Battisti et al. 2009), but astonishing little references are made to the Tanzanian case.

In summary, the following challenges to developing the high-value vegetable sector and include smallholders into these value chains are identified (Barham 2006; Davis 2006; Henson and Reardon 2005; Narrod et al. 2007; Ponte and Gibbon 2005; Temu and Marwa 2007; Temu and Temu 2006; Van Der Meer 2006)(de Putter et al. 2007; Eskola 2005):

- Producers are in rural/remote areas whereas the local markets are concentrated in urban centres making both physical accessibility (infrastructure) and accessing market information difficult.

- Poor linkages of farmers to potential markets

- Lack of access to financial services for farmers’ activities

- Systematic access to timely and reliable market information

- Quantity of produce per individual producer is still very small

- Standards and quality demand of fruit and vegetable consumers (local and external markets)

- Traders of crop produces in the value chain seem to be more organised than the producers giving them the edge to take advantage of the earlier.

- Value addition issues add new challenges to smallholder producers making it even more important to collectively facilitate the conduct of the marketing function

- Changes in the national and global governance of fruit and vegetable marketing chains

Pauw and Thurlow (2011) report that based on household surveys poverty-growth elasticities (PGE) and undernourishment-growth elasticities (UGE) in Tanzania does not correspond with the current literature. The authors explain this anomaly with the specifics of Tanzanian growth structure. Although the growth is highly driven by the agricultural sector (usually a good indicator for economic growth driven poverty reduction and nutrition improvements), it does only translate in a very limited degree to (i) declining level of poverty and (i) increasing nutrition. The modelling suggests that a maize-led agricultural growth would yield both, the strongest poverty reduction and the strongest nutritional improvements.
2. Theoretical background

This succeeding section provides the theoretical background for three concepts used throughout the study. A first section is devoted to the new institutional economic literature and its application in a developing country context. Secondly, the concept of a value chain is presented, followed by an overview of the discourse on smallholder involvement and agricultural development.

2.1. New institutional economics and its use in developing and emerging economies

New institutional economics (NIE) builds upon the achievements of neoclassical economics, but complements its perspective with a focus on the rules, and social and legal norms, which underlie any economic activity. Thereby the differentiation between institutions and organisations is essential (North 2005). Institutions are understood as a set of formal and informal rules of conduct and may include laws, contracts, political system, norm, traditions and value systems among others. This institutional context is particularly important in developing countries with their high prevalence of informal rules. Organisations on the other side are defined as structures of rules.

In terms of the scales and levels of social analysis, Williamson (2000; 2005) has provided a structure with four levels of analysis where institutions can be located. The first level is the level of social embeddedness and includes norms, customs, mores and traditions. The second level is the institutional environment where “formal rules of the game” are studied and the property rights are of particular interest. In the third level, the institutions of government are studied and the “playing of the game” is in focus whereas particular emphasis is given to contracts. Lastly, the forth level of analysis refers to resource allocation and employment, is concerned with prices and quantities as well as incentive alignment. This is mainly the domain of the neoclassical economics. The project will mainly analyse institutions and organisations located at the levels two and three.

Within the NIE framework, the analysis of modes of organisation and cooperation in economic activity has been a recently emerging research field. The organisation and cooperation takes place at the horizontal (among the actors located at the same stage within a supply-chain, e.g. the producers) as well as at the vertical level (among the actors along a supply-chain). Regarding the former, Thorelli’s work (Thorelli 1986) introduced the concept of clusters or supply-chain systems. Regarding the vertical modes of organisation and cooperation, Williamson (1991) identified three modes of governance of vertical organisation and cooperation: Markets, hybrids and hierarchies. Menard and Vaiceschini (2005) have further developed the concept of hybrid organisations by analysing various hybrid organisations such as subcontracting, cooperatives, franchising, and others and by relating them to asset specificity and transaction costs, which is of particular interest to the project. Ménard’s classification of hybrid forms in four types – trust, relational networks, leadership, and formal government – has been applied with success for food initiatives in European and in developing countries (Réviron et al. 2008; Réviron & Tseelei 2009). Réviron (2006) suggested using the distribution of power between seller and buyer regarding the quality fixing instead of asset specificity as introduced by Ménard.

Although certain elements of new institutional economics have become economic mainstream thinking, NIE has hardly been applied to a developing country context. Kherallah and Kirsten (2001) emphasise the importance of a NIE framework for the analysis of the agricultural policy research in deve-
oping countries. Namely, they identify the following fields: (i) contract farming and other vertical linkages; (ii) cooperatives and other farmer organisations; (iii) grades and standards; (iv) traders behaviours and performance; (v) access to agricultural input and rural credit markets; and (vi) institutions for risk management and market information. As general recommendation, they suggested the application of NIE concepts and methodology may bring new insights to research question where the mainstream neo-classical (development) economics only provides unconvincing answers. Specifically Kherallah & Kirsten primarily identify the topic of “new world food and agricultural industry” and the “relationships in well-developed and highly sophisticated food supply chains to the informal institutions governing grades and standards in developing countries” (p.36).

In the meanwhile NIE has further made its course into mainstream development thinking (Andrew Dorward Jamie Morrison, Colin Poulton, 2005). This may be best illustrated by fact that the World Bank’s annual report in 2001/2002 (World Bank 2001) was dedicated to “Building institutions for Markets” a highly NIE-driven topic.

The literature on agricultural value chains for development easily relates to NIE with its focus on the governance aspects of value chains. However, there is yet no concept consistently integrating NIE into value chain methodology. (Jordaan et al. 2014) suggests using an integrated value chain framework where NIE is integrated into classical value chain analysis, which permits the analysis of the incentive structure embedded in the social, physical and institutional environment within which the farmers operate. Furthermore, particular focus is given to the relationship between the farmers and their buyers to identify the appropriate coordination strategy, which minimises the transaction costs incurred.

Transaction costs

Transaction costs are an essential concept of NIE. They are understood as the costs that are inherent to conducting a transaction - an exchange of good and/or services and have been developed by Coase (1937) and further refined by Williamson (1981). However, in operationalizing the transaction cost theory, there are different approaches. Grover and Malhotra (2003) argue that transaction costs can be divided into coordination and transaction risks. Coordination costs are the costs of exchanging information and for using these in decision processes. Transaction risks include the risk that other party in the transactions will escape their agreed commitments. Eaton et al (2008) suggest that three different types of transaction costs can be distinguished, along the three “C”’s of a transaction: (i) search and information costs (“Contact”), (ii) bargaining and decision costs (“Contract”), and (iii) supervision and enforcement costs (“Control”). Eaton et al. argue that transaction costs are conceptually inseparable of production costs. Therefore they can be assessed by comparative analysis where different types of institutional arrangements (or governance structures) are compared with comparable types of transactions. For the fresh fruit and vegetable sector Eaton assume that the transaction costs incurred are determined by the asset specificity (dedicated assets, temporal specificity, and site specificity), the uncertainty involved, the difficulty of performance measurements, and the coordination, which is understood as connectedness with other transactions.

With regard to the application in the agri-food sector Lu et al. (2008) showed that personal relationships and trust reduced the transaction costs in vegetable transactions in China.

While the transaction cost theory is well developed (Klaes 2000) its operationalization is far less concise (Wang 2003). For empirical research they are usually divided into search and information costs, negotiation costs, and monitoring and enforcement costs (Gabre-madhin 2001; Lu et al. 2008).
In order to make transaction costs operational they are divided into search and information, negotiation, and monitoring and enforcement costs. In the agri-food sector, the indicators outlined in Table 1 were used.

Table 1: Indicators used for operationalising transaction costs in the agri-food sector

<table>
<thead>
<tr>
<th>Transaction cost type</th>
<th>Indicator used</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Search and information costs</strong></td>
<td>Number of days spent for searching market and trading partner information</td>
<td>Lu et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Number of buyers (Lu 2008)</td>
<td>Gabre-Madhin (2001)</td>
</tr>
<tr>
<td><strong>Negotiation cost</strong></td>
<td>Number of negotiation rounds before agreeing on price</td>
<td>Lu et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Number of price offers</td>
<td>Gabre-Madhin (2001)</td>
</tr>
<tr>
<td><strong>Monitoring and enforcement cost</strong></td>
<td>Advice of buyers regarding quality</td>
<td>Lu et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Duration of relation</td>
<td>Lu et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Cheating</td>
<td>Lu et al. (2008)</td>
</tr>
</tbody>
</table>

2.2. Value chain

The value chain\(^1\) concept gradually immersed into the academic and development discourse in the late 1990’s. Today the concept has become standard terminology particularly in the development cooperation discourse. Kaplinsky and Morris “Handbook of value chain analysis” (Kaplinsky & Morris 2001) has been highly influential and even today a reference publication for many development practitioners. In the academic discourse, at least three streams of thinking were highly influential in shaping the value chain concept. Firstly, Michel Porters work on competitiveness has introduced the term value chain (Porter 1985). Secondly, the "filière" approach of the French literature (Lauret 1983; Griffon 1990) with a particular emphasis on “getting the institutions right, rather than the prices” (Raikes et al. 2000, p. 14). And thirdly, the global commodity global value chain analysis led by Gereffi (Gereffi 1994; Gereffi et al. 2005), which is an application of the concept to the developing countries.

According to Kaplinsky and Morris’s handbook (Kaplinsky & Morris 2001) a value chain includes:

"...the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use."

Kaplinsky and Morris emphasise that there are three important features of value chains that render the "heuristic device into a powerful tool "for structuring the analysis: (i) the value chains are repositories

\(^1\) While the concept has some similarities with the term “supply chain” the latter focuses exclusively on moving a product from the source (producer) to the destination (consumer) and there are no binding market relationships while a value chain consists of actors that actively cooperate to improve systemic efficiency and competitiveness (Shiferaw et al. 2008).
for rent and these rents are dynamic, (ii) effectively functioning value chains involve some degree of “governance”, and (iii) different types of value chains exist. In the present study all three of these elements are included into the analysis; the findings part 1 is based upon the premise that different types of vegetable value chains exist and a typology is developed. When these value chain types are distinguished their governance modes are used as one of their key characteristics. Finally, the rents of different value chain actors are assessed in the second findings chapter.

Elements of a value chain

The main entities constituting a value chain are economic actors, which collaborate in one way or another in order to bring a good or a service to the consumer. A firm may be a typical economic actor, but often other actors such as farmers or farmer groups, individuals or governmental or non-governmental agencies may be part of a value chain.

The central motive of a value chain is that the actors collaborate in order to deliver a good or a service to the consumer. Therefore the emphasis is clearly on (vertical) collaboration along the value chain (Roduner 2004; 2007).

Figure 1: Elements of a generic value chain

Figure 1 depicts the elements of a generic value chain. The representation of the value chain follows the typical life cycle of most vegetable products and typically includes input provision, production, brokering and trading, processing, wholesale and retailing and consumption. Since in the current focuses on the producer perspective the following value chain actors are distinguished:

- Input suppliers: Provision of agricultural inputs such as seeds, fertilisers, and pesticides.
Vegetable value chains in northern Tanzania

- Producers: Cultivation of the products.
- Transporters: Transportation of any goods, be it inputs, or final products between the other actors.
- Traders/Brokers/Collectors: Intermediaries bulking-up the products between the farm gate and the wholesale markets. While traders actually own the products, brokers or collectors only trade the products on the trader’s behalf and operate on a commission basis without having ownership.
- Processors: Processing raw agricultural products into foodstuffs.
- Wholesaler: Operating at a wholesale market, where raw products are sold at large quantities.
- Retailer: Trading between the wholesale markets and the final consumer, operating at relatively low quantities.
- Consumers: Final destination of the product.
- Facilitators: Intervening in the value chain for its upgrading.

The relations between those actors may have the following meanings:
- Flow of products
- Flow of information
- Contractual relations
- Organisational association

2.3. Agricultural development: Commercialisation and smallholder inclusiveness

According to the literature (IFPRI 2005) the concept of small farms lacks a clear definition. The most used approach is to define small farms on the basis of their landholdings or livestock number. Usually the size of 2 ha of cropland is used as threshold for a small farm. Further attributes often referred to small farms are smallholder, family subsistence, resource-poor, low-income, low-input, or low-technology farming.

While using a two hectares threshold to distinguish small farms might be tempting, it is to be emphasised that the concept of small farms is highly context-specific; while holding two ha of irrigable and fertile agricultural land might put a farmer at a different position than holding two ha of semi-arid land in a marginal area.

For several countries in Eastern and Southern Africa Jayne et al. (2003) show that the two ha threshold is rather high, since in many countries, such as Ethiopia, Rwanda, and Mozambique the average land access is below two ha. Thus, for the present research the following working definition for the concept of smallholder is used: A smallholder is a farmer having access to less land than two ha. The farm is often run as family farm, subsistence farming (at least to some degree) is common, production is often done under low-input and low-technology constraints.

Salami et al. (2010) report that Tanzanian agriculture is largely dominated by smallholders, with a share of 75% of the total agricultural production originating from smallholders.
Comparative advantages of small farms

In the literature there is often an inverse relationship between farms size and production per unit of land made (Hazell et al. 2007). Therefore smaller firms tend to obtain higher gross and net returns per ha of land than larger farms. The explanations for these diseconomies of scale are different transaction costs for different operations. Small farms have transaction cost advantages in (i) unskilled labour, supervision, and motivation, (ii) local knowledge, and (iii) food purchases and risk (subsistence). Large farms on the other hand have lower transaction costs for (i) skilled labour, (ii) market knowledge, (iii) technical knowledge, (iv) input purchase, (v) access to finance and capital, (vi) access to land, (vii) output market, (viii) product traceability and quality assurance, and (ix) risk management (Poulton et al. 2010).

Small farms typically operate in a very labour intensive way, employing labour from their own household, as well as from their equally poor, or poorer neighbours. For larger farms, employing additional labour often incurs high transaction costs. Collier & Dercon (2013) argues that neither an exclusive focus on smallholders nor on large estates will be the solution for the world’s poverty and food crisis for the next 50 years but rather a more dynamic agriculture combining the two. For the smallholder this implies that they will have to considerably increase their productivity by improving their skills and technology, providing finance and access to capital, and organisation of logistics of trading, marketing and storage.

Smallholder involvement in modernised value chains

The basic threat is that in a modernised value chain, there is a potential danger that smallholders are squeezed out of the market. This is essentially caused by high transaction costs in almost all non-labour transactions. Opposed to the evident comparative disadvantages of smallholders vis-a-vis larger producers, smallholders have comparative advantages since they have low costs in accessing family labour, and intensive local knowledge (Markelova et al. 2009).

With regard of access to markets collective action such farmer organisations may bring a number of benefits for smallholder producers. Collective action may be a mean to (i) reduce transaction costs of accessing input and outputs, (ii) obtain market information, (iii) secure access to new technologies, (iv) access new market opportunities, in particular supply chains of high-value products. (v) Collective action may reduce barriers of entry to markets by improving the bargaining power with other supply chain actors, and (vi) collective action may compensate to a certain degree for lack of basic infrastructure and services, such as roads, access to water, education, and others (Markelova et al. 2009).

Collective organisation and smallholder agriculture

Although smallholders may have a comparative advantage in the labour intensive production of horticultural products, they are confronted with limited economies of scale when marketing the produce or when buying input supplies. The constraints range from small production quantities and heterogeneous quality of produce to limited access to input supplies, capital, market information and the necessary farm management skills. To overcome at least some of these constraints, collective action through collective organization of some kind is an essential first step (Narrod et al. 2007).

Among the literature on collective action and organization, the enabling conditions for successful collective organisation include the following: small size of group, clearly defined boundaries, shared values, past successful experiences appropriate leadership, interdependence among group members,
heterogeneity of endowments and homogeneity of identities and interests, and low levels of poverty (Agrawal 2001). In his study on how Tanzanian farmer groups enable their marketing performance, Barham (2006) concludes that the mature groups with functioning internal activities, a strong asset base of natural capital, and the ability to quickly leverage group resources were the most important characteristics to improve their market situation. However, Barham emphasises that the promotion of smallholder farmer groups is a long-term, time consuming task and not any farmer should be transferred to an entrepreneur, since the success is closely linked to the smallholders asset base (Barham 2006).

3. Research objectives and research design

3.1. Problem formulation

Changing global agri-food chains: Towards high-value agriculture

The global food economy has changed substantially within the last decade. Birthal et al. (2005) summarise that this is due to a combination of rising demand in industrialised countries for fruits, vegetables and other high value products including processed foods, as well as a growing demand for high-value agricultural products within developing countries. In addition the restructuring of food marketing channels is affecting the industrialised as well as the developing countries markets (Fresco 2006).

In Sub-Saharan Africa, as well as in the other emerging and developing regions, these developments have led to a shift in production from traditional export commodities like coffee, sugar, cotton and tea towards non-traditional products from high value agriculture (HVA). Products from HVA are characterized by relatively high unit values and face relatively high income elasticity of demand (Jaffee and Gordon 1993). Typical high-value products include dairy and meat products, fruits and vegetables, fishery products, spices and herbs. HVA products are the fastest growing components of international agricultural trade. For example, the export value (in relation to all agricultural exported crops) of traditional tropical products like coffee, cacao, tea and sugar from developing countries decreased from 40% to 19% between 1980 and 2000. In the same period, the export value of horticultural products from developing countries increased from 16% to 21% (Davis 2006). Thus HVA has moved from a niche phenomenon to the mass market.

The production of fruits and vegetables entails significant development benefits, and there has been a rapid growth in their production during the past three decades. Producing fruits and vegetables is profitable and smallholders can earn significantly more than by growing traditional staple food crops (von Braun 1995; Weinberger and Lumpkin 2005). Fruit and vegetable production is also labour intensive and has the potential of providing significant employment, as well as income (Weinberger and Swai 2006). Gender dimensions in African horticulture are important since vegetable production is often in the hands of women (Dolan and Sorby 2003). It has been shown that women are heavily part of the African vegetable labour force as between 50 and 75% of the vegetable workers in South Africa, Kenya and Zambia are female (Barrientos et al. 2003). Increasing fruit and vegetable production can not only bring about improved economic opportunities for smallholders, but their increased consump-
tion can also help overcome widespread micronutrient deficiencies in the developing world (Weinberger and Lumpkin 2005).

**Booming vegetable exports from East Africa and raising food safety and quality requirements**

Across East Africa, the export-oriented horticultural sector has grown considerably in recent years. A well-studied example has been the green bean export industry in Kenya, where the global demand for year-round availability of vegetables has propelled the emergence of the export vegetable sub-sector. The main market for this produce is Europe, and there has been increasing concentration of retail sales there through major supermarket chains. As a result of consumer pressure and increased liability issues, the European retailers have enforced food safety and food quality requirements on their suppliers by implementing private agricultural standards such as GlobalGAP or BRC (Henson and Reardon 2005). With the formulation and implementation of production and processing standards the retailers have significantly altered the supply chains. This has resulted in increased vertical integration between the producers and the retailers and in some cases to an increased competitiveness of the producers (Jaffee and Maskure 2005). The large retailers now effectively pilot the value chains by virtue of the private standards they now enforce on suppliers to protect both themselves and consumers (Ponte and Gibbon 2005).

It can be difficult for smallholders to comply with ever-rising standards and to participate in this demanding business environment (Cacho 2003; Temu and Marwa 2007). Therefore development agencies like USAID, DFID and GTZ have become involved in projects to link smallholder farmers to these potentially lucrative markets by focusing on compliance with GlobalGAP or other standards. GlobalGAP has two certification options, one for the individual farm and one for farmer groups. Regarding the latter, the farmer group’s internal control system is audited and a randomly selected number of individual farmers are audited. This measure aims at reducing the cost of compliance with the standards. As these standards are being rapidly implemented and requested by major European retailers, compliance with GlobalGAP is perceived as the entry ticket for accessing the export market. For smallholders, the hurdles to achieve compliance are considerable: Besides the direct cost for the auditing, there are also the indirect costs for modifications on the farm and changes to its management, such as the implementation of a thorough record-keeping system. While the cost for initial certification in Kenya have been estimated (Graffham et al. 2006) at roughly USD 800 per farmer, the recurring annual costs of USD 100 are still clearly above a typical smallholder’s economic potential. In addition to these high costs, no specific price premium is paid, since GlobalGAP is considered as a minimum standard.

Commercial vegetable cultivation in Sub-Saharan Africa is highly intensive and pesticides are extensively used (Bon et al. 2014). Ngowi et al (2007) report heavy use of pesticides for the study area in Northern Tanzania. 70% of the vegetable producers routinely apply insecticides and there is a trend in even increased application of insecticides and herbicides were stated, about a third of the vegetable producers apply mixtures. Of course this practise implies serious health risks. 68% of vegetable producer reported that they at least felt sick after routing pesticide application.

**Smallholder participation in domestic vegetable supply-chains**

Recent impact assessments of smallholder integration into GlobalGAP-certified vegetable production in both Kenya and Zambia conclude that the market volatility and the annual dropout rate of smallholders is very high, even with the heavy investments of development donors (Graffham et al. 2006;
Graffham and Macgregor 2006). Doubts have been raised whether it is justified to invest development funds into linking smallholders to these capital and knowledge intensive value chains (Temu and Marwa 2007). One may argue that investments in certifying smallholders with particular agricultural standards through development funds essentially subsidize European retailers.

The situation is somewhat different for high-value domestic value chains, such as supplying supermarkets, or direct marketing to buyers demanding high-quality products such as upper class hotels and restaurants or specialty shops. The confidence in the reliability of these value chains is based upon the fact that rapid urbanization is taking place in East Africa with the emergence of small middle and upper income classes (Temu and Temu 2006; Tiffen 2003). While supermarkets are still small in numbers and their sales are yet relatively modest, it is to be expected that their market share will grow in the future (D’Haese and Van Huylenbroeck 2005; Weatherspoon and Reardon 2003). The fact that Tanzanian supermarkets import a considerable share of the fresh vegetables and fruits from South Africa clearly shows that the opportunity for local suppliers to meet this demand is not being met. Personal communications from such supermarket managers indicate that there is a great interest in sourcing from local producers. However, the crucial criteria to enter into a sustainable business relationship, such as delivering the right quality and quantity on time are not currently being met by domestic producers. However, current literature suggests that the emergence of supermarkets may have been overestimated, but still the main opportunities for smallholder are in the rapidly growing domestic and regional markets (Tscharley 2007).

3.2. Hypotheses and research questions

The basic research objective of the project was to find out the economics of vegetable, high-value, value chains in Tanzania and assess the potential for African smallholders to successfully participate in these potentially lucrative value chains.

More specifically, the academic purpose of the project is to project aims at contributing to the academic discourse in the following three fields:

- Identification and analysis of the most important institutions and organizations of potential high-value vegetable value chains in a SSA context. This includes a general understanding on how emerging domestic VC of high-value products in developing countries in general and in Africa in particular are organized and governed.

- Identification and analysis of collective organization and collective action in vegetable value chain as a pre-condition for smallholder participation in high-value value chains.

- Identification and analysis of successful as well as less-successful patterns of interventions by external facilitators in vegetable VC who aim at contributing to economic growth and poverty reduction.

Hypothesis formulation has a long tradition in natural sciences and is mainly used to guide the research process and the ultimate goal of the research is to falsify the hypothesis’ statement. The epistemological problem inherent is that any hypothesis is loaded with pre-assumptions and thus no clear inductive process of generating theory is valid in the strict sense. Since this problem is particularly relevant in social sciences, hypotheses are often used differently in the research process. In the following the approach as used qualitative social research is followed. Thereby hypotheses are based on the
problem formulation a hypothesis is formulated and research questions are derived. Thus, the re-
search does not ultimately aim at falsifying the hypothesis but rather seeks to answer the research
questions.

Based on the research interest expressed above the following hypotheses were formulated:

Hypothesis 1: Value chain structure and governance

The dynamic nature of vegetable value chains calls for sophisticated modes of cooperation and organisation
among value chain actors. According to their function as well as to their governance several different value chain
types may be distinguished.

Hypothesis 2: Smallholder participation

Long-term participation of smallholder farmers in high-value supply chains is achievable, potentially profitable and improves the livelihoods of smallholders’ households.

Participation of smallholder farmer groups is easier to achieve in domestic value chains than in export-oriented
value chains.

Hypothesis 3: Collective action and entrepreneurship

Collective action and collective organisation is a potential strategy for smallholder producers to access high-value
vegetable supply chain. The decision to engage in a form of collective action is based on the smallholders as-
essment of costs and benefits of the collective action initiative.

Potential benefits include: Increased efficiencies in procuring and accessing the agricultural inputs, lowered trans-
action costs in marketing the product, improved access to high-value supply chains, increased negotiation pow-
er, increased access to R&D, and political advocacy.

Potential costs include: Loss of independence (individual decision power), and governance cost (time and funds)
of collective organisation.

Collective action and organisation of smallholder producers might be enabled by an entrepreneurial spirit of a key
actor in the supply chain.

Hypothesis 4: External facilitation

External efforts will generally be necessary to get smallholder producers integrated into potentially profitable but
demanding value chains, like the domestic high-value supply chains or the export-oriented value chains.

A phasing-out-strategy is essential for the long-term efficacy of the intervention.

The justification for each hypothesis and the deducted research questions are detailed in the respec-
tive chapters below.
3.3. Research design

The study is based upon the application of multiple complementing methods. According to the research interest, first the value chains are identified and mapped leading to a typology of vegetable value chains in the study area. Furthermore, a detailed analysis of prices and gross margin for all major actors were applied. Subsequently, a quantitative producer survey was conducted, completed with focus group discussions of producer groups. The analysis of the facilitators’ interventions was primarily based upon guided interviews with facilitator representatives and document analysis. The Figure 2 below schematically presents the research design.

![Value chain analysis](image)

**Figure 2: Schematic representation of research design**

The detailed methods are elaborated and outlined in the respective findings chapters. Chapter 1 develops a typology of vegetable value chains with their governance mode as an essential characteristic. Chapter 2 analyses the profitability, the smallholder involvement, and the producers’ collective action of these value chains. Chapter 3 presents and analyses the interventions of external facilitators in the vegetable value chains.
1. Introduction

The first chapter aims at developing a typology of the main object of research - value chains of vegetables in the case study area. First the relevant concept are developed and discussed and subsequently, it is shown how the latter are put in practise by developing a typology of functionally different value chains in the study area. Thereby, the research interest as described below has been used to guide the research.

1.1. Research interest

The following section presents the problem formulation, the hypothesis, and the research questions as they were developed and expressed ex-ante.

Problem formulation

The problem to be addressed in this first chapter is expressed as follows:

“Emerging value chains of high-value products like vegetables are very dynamic and have complex organisational configurations. They are constantly influenced by changing consumer preferences and market liberalisation trends. The value chains are thus rapidly changing with diverse implications for actors along the value chains and the overall governance of the value chains. In order to comply with the requirements of this dynamism, producers as well as other actors along the chain are required to adapt their modes of cooperation and organisation."

This characterisation of the context and the problem then leads to the following hypothesis.

Hypothesis 1: Value chain structure and governance

The dynamic nature of vegetable value chains calls for sophisticated modes of cooperation and organisation among value chain actors. According to their function as well as to their governance several different value chain types may be distinguished.
Research questions

The below stated research questions are to be addressed in this chapter and we will summarise the results of this chapter by answering these questions in the interpretation (p.49).

1. What types of vegetables supply chains exist in Tanzania?
2. Who are the actors involved and what is their role?
3. What are the governance modes of the vegetable supply chains identified?
4. What are the transaction characteristics along the supply chains?
5. What are the food safety and food quality requirements for the identified vegetable supply chains?

2. Theoretical background

2.1. Governance modes of value chains

From spot markets and hierarchy to hybrid forms

The concept of governance modes in emerges from a rather “micro-oriented” perspective of new institutional economics, which mainly aims to address the question how can transactions be secured (cf. pp.4 ). The basic phenomenon on types of actors involved in economic activity was developed by Coase in his original article on the “Nature of the firm” (Coase 1937). His basic argument is that the boundary or the extent of firm and their organised transactions is shaped by (i) the cost to use a market and (ii) the cost to govern the internal organisation of the firm. Thereby he paved way to the concept that the boundaries of a firm are entirely dynamic and thus subject to constant change, e.g. he explicitly mentioned that the supply price of factors is a major determinant for a firm’s growing (p. 397).

It took a while until the subject was back on the scientific, economic discourse. Williamson (Williamson 1991) identified three different forms of economic organisation: Market, hybrid and hierarchy. These forms of economic organisation might build the nexus between the previously reconciled institutional environment and the organisational outcome. Each types of economic organisation, be it market, hybrid or hierarchy, has a particular set of asset specificity which in turn determine the governance cost of the organisational form.

In a later paper (Williamson 2002) he explicitly introduces the term of the firm as a “governance structure” using it for the concept above named “form of economic organisation”. Thereby the governance structure is an important mean to economise transaction costs. This perspective on the firm a governance structure does fundamentally differ from the neo-classical perspective on the firm as a production function.
Menard (2004) took the concept of hybrid forms of governance a step further. Building on Williamson’s hybrid forms being between market and hierarchies, Menard called the hybrids “A collection of weirdos” to express their heterogeneity. The proposed typology of hybrids may be summarised as follows:

- Transactions can be made through markets, within (internal) hierarchies, or along hybrid organisations.
- The hybrids have heterogeneous configurations, and they are characterized by the pooling of resources, contracting arrangements, and competing forces.
- Hybrids are determined by (i) the degree to which investments create mutual dependence, (ii) the degree of uncertainty of the transaction they want to coordinate (opportunism).
- The mode of governance of hybrids has to take into account contractual hazards and difficulties in rent-sharing.
- Based upon the specificity of the assets involved, and the resulting transaction costs, a typology with trust-based relations, relational networks, leadership-oriented, and formal government is suggested.

The following graph illustrates the relation between governance structures, their transaction costs, and the specificity of the assets involved in the transactions.

![Figure 3: Typology of hybrid organisations after Menard (2004)](image)

Since the above concepts are highly abstract it is now focused a bit towards their reception and application in an agricultural and developing country context.

**Governance structures in agricultural and/or development country context**

In their overview of the pertinent empirical literature Masten and Michael (2000) argue that “agricultural transactions provide a rich and largely unexplored area for application and refinement of transaction cost theory” (p.190). Menard and Valdeschini (2005) ventured into that unexplored area and emphasised the importance of the interactions among the involved organisation and their institutional ar-
rangements for the agri-food industry. Since the authors focus on contemporary, western-European agri-food industry, their conclusions are basically drawn from the focus on the modalities, how quality of the products can be developed and communicated on the one side and guaranteeing their food safety on the other side. With regard to a developing country context, this argument may only hold true in very specific cases types of value chain, which have similar configurations such as e.g. high-value products.

Gereffi being the most prominent advocate of an array of authors on global value chains (GVC), bases its work empirically on modern supply chains of globally traded goods, explicitly also including agricultural goods (Gereffi et al. 2005). They argue that the governance form of global value chains is determined by three elements:

- Complexity of transactions: The complexity of information and knowledge transfer required to sustain a particular transaction, particularly with respect to product and process specifications.
- Codifiability of information: The extent to which the above mentioned information and knowledge can be codified and transmitted efficiently without transaction-specific investment between the parties to the transactions,
- Capabilities of suppliers: The capability of actual and potential suppliers in relation to the requirements of the transactions.

Furthermore, Gereffi et al (2005) suggest a typology of global value chains that includes (i) markets, (ii) modular value chains, (iii) relational value chains, (iv) captive value chains, and finally (v) hierarchy. Gereffi’s works focuses on global value chains, which means that transactions typically take place in physically (and cultural) distant or remote places. Under this premise it is little astonishing, that the codifiability of information is a key determinant of the governance of a value chain. The first determinant, complexity of transaction, refers to the second one as codifiability of information is highly dependent on the complexity of transactions, e.g. usually only the information of a relatively little complex transaction can be easily codified.

3. Methods

The principal objective of this chapter is to identify and distinguish different value chain types in the study area. Since value chain analysis has become a fashionable instrument in development cooperation a wealth of manuals and tools are available (Roduner 2007; Nang et al. 2011). Typically, these manuals are fairly extensive documents with many tools provided to identify and analyse value chains. Due to their origin in development cooperation they share the general logic that first the value chain is appraised, subsequently an intervention strategy is designed, then the interventions are implemented, and finally the interventions are to be monitored and evaluated. For the present research the exclusive focus was on the first, the identification and in-depth analysis of vegetable value chains. Thus a custom set of methods was chosen and applied as summarised in the table below.

<table>
<thead>
<tr>
<th>Method</th>
<th>Target group</th>
<th>Number of observations</th>
</tr>
</thead>
</table>

Table 2: Methods used in value chain analysis
Findings part 1: Typology of vegetable value chains

<table>
<thead>
<tr>
<th>Method</th>
<th>Source of Information</th>
<th>n.a.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature and document review</td>
<td>Vegetable sector of study area</td>
<td>n.a.</td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>Key informants</td>
<td>29</td>
</tr>
<tr>
<td>Informal qualitative interviews</td>
<td>Value chain actors</td>
<td>42</td>
</tr>
<tr>
<td>Focus group discussions</td>
<td>Producer groups</td>
<td>8</td>
</tr>
<tr>
<td>Informal conversation</td>
<td>Value chain actors</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Direct observation</td>
<td>Value chain actors</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

**Initial value chain appraisal**

In a first step the vegetable sector in the study area was to be assessed by means of a document and literature review. The available literature was largely originating from previous development interventions providing characterised by its anecdotic rather than systematic nature. However, it provided instrumental entry points for the personal key informant interviews that were based on semi-structured interviews and were held in April and May 2009. In this time a total of 29 interviews were conducted with key informants from the following stakeholders: Management of agro-food-enterprises (5), development intervention implementers (5), private-sector consultants (4), traders and wholesalers (2), individual producers and producer groups (3), government officials (3), development agencies (3), retailers (2) and representatives of research organisations (2). This initial data collection was complemented by participatory observations at market places, retail outlets, agro-enterprises, and farms.

**In-dept value chain analysis**

While the initial value chain appraisal depended to a large degree on key-informants of secondary sources of information, it was decided to obtain some first-hand information from the stakeholders actually involved in the individual value chains in order to validate and analyse the identified value chain types. In order to analyse the value chain in detail data on the following topics was collected: Actors involved, mode of governance, the required quality specifications, the embedded transaction modalities, the stability of the farm-gate prices, the persistence of producers, and the involvement of facilitators. Therefore a value chain tracing was adopted where all the actors from production to consumption were traced. The methods used were qualitative interviews with value chain actors (42), focus group discussions with farmer groups (8), informal conversation with actors, and direct observation. For a visual representation of the value chains’ structure and the inherent relations a two-step value chain mapping (Herr & Muzira 2009) was applied.

The data collection largely confirmed the results of the initial value chain appraisal; no additional value chain types were added to the typology. The data collection for this main phase took place during August 2009 to January 2010.

**Price monitoring system for green markets**

During the initial value chain appraisal it became clear that that considerable price fluctuations are an important characteristic of the whole vegetable sector. Therefore it was decided to implement a price monitoring system at the green markets for the wholesale and retail transactions.
As a first step, the major vegetable market places in the Arusha area were visited and their mode of operation and their characteristics were assessed. Then it was decided to monitor the at prices four marketplaces (p.22).

Price information was monitored on a weekly basis (average mid-day prices on particular weekdays) on both, the wholesale as well as on the retail level for all of the available vegetables at a particular market place. Initially, a self-reporting procedure with by the market personnel was foreseen. However, this proved to be highly unreliable and it was decided to obtain the price information from trusted informants at each market place personally. So we had to identify potential informants and obtain their trust. Particularly the wholesalers were initially reluctant to reveal price information and quite some effort was required to gain their trust.

The informants were visited personally weekly and the price quotations obtained were triangulated with sporadic product purchases. Price data was collected from October 2009 for the whole duration of the field study period until December 2010. A database was used as data repository comprehending the price data and the standardisation of the units.

In order to obtain comparable data between wholesale and retail transactions, the traded units had to be standardised. The vegetables are typically traded in a vast variety of units. Examples of typically used units are wooden crated, baskets, sacks of many different sizes, piles, bucket and others. Thus, the trading units were standardised based on their metric weight. For each vegetable at least ten weighting for each unit were taken and recorded. Where the variance was found to be big, another five measurement were taken. Once the sample data was compiled mean values were calculated and applied for the relative prices per kilogram.

Overall 19 vegetables¹ were monitored at the four market places with a total of 5’878 price quotations.

### 4. Results

Subsequently the empirical results of the value chain analysis are presented. Therein a typology of value chains is developed that distinguishes between different value chain types. First a brief overview on the identified value chains is provided. Subsequently each identified value chain type is described in detail on a common structure.

#### 4.1. Value chain types identified

The result of this initial value chain appraisal was the identification of five different value chain types. The observed heterogeneity inherent to vegetable cultivation and marketing required making considerable generalisations to identify the different types. The types are (i) rural and urban green markets, (ii)

---

¹ Onion, tomato, cabbage, carrot, sweet pepper, garlic, ginger, green bean, cucumber, eggplant, african eggplant, okra, potato, beet root, broccoli, cauliflower, celery, fennel, chinese cabbage, snow pea, red cabbage, and lettuce
seed production, (iii) processed vegetables, (iv) institutional buyers and tourism, and (iv) fresh vegetable exports. Table 3 below outlines the key elements of the value chains differentiated.

Table 3: Key elements of identified value chain types

<table>
<thead>
<tr>
<th>VC type</th>
<th>Rural and urban green markets</th>
<th>Seed production</th>
<th>Processed vegetables</th>
<th>Institutional buyers and tourism industry</th>
<th>Fresh vegetable exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables included</td>
<td>Any vegetable available: Traditional as well as exotic vegetables(^2)</td>
<td>Tomato, sweet peppers, egg-plants, cucumbers, African eggplant, and okra</td>
<td>Mainly tomato; chillies, onion, garlic and others in small quantities</td>
<td>Wide range of exotic vegetables some traditional vegetables</td>
<td>Green beans, snow peas, baby corn, and hot peppers</td>
</tr>
<tr>
<td>Consumers of final product</td>
<td>Domestic urban and rural consumers</td>
<td>Seed for vegetable producers in Tanzania and in neighbouring countries</td>
<td>Processed products for middle-class, urban consumers domestically and in neighbouring countries</td>
<td>Affluent, urban consumers and tourists</td>
<td>Consumers abroad, mainly in Europe</td>
</tr>
<tr>
<td>Volumes</td>
<td>The default value chain with by far the greatest volume</td>
<td>Modest volume</td>
<td>Modest volume</td>
<td>Small volume</td>
<td>Modest volume</td>
</tr>
</tbody>
</table>

In the following each value chain type is presented in detail according to the product involved, the actors involved, its governance mode, the required quality specifications, the embedded transaction modalities, the stability of the farm-gate prices, the persistence of producers, and the involvement of facilitators.

**Rural and urban green markets**

The role of green markets for reaching the vegetables to the consumers can hardly be underestimated. These markets represent the backbone as well as fall-back solution for all other value chains, assuming the products are actually traded at the green markets. The term "green market" is used here for a centralised location where the exchange of mostly fresh vegetables (usually among other products) takes place on a regular, often daily basis. These markets can be found throughout Northern Tanzania and are responsible for the marketing of most vegetables in the study area. In order to get some detailed insights, the following four market places have been studied in detail:

\(^2\) See annex 5 (p.121) for the complete list.
**Investigated green markets in the Arusha region**

Combine all three market in one generic description insofar this is possible it is assumed that they contain more or less the same governance structure as indicated in the detailed reporting on the market outlet situations. This generalisation may entail a severe simplification since due to the amount of work load it is not comprehended elsewhere. Hence, the generalisation – as any other generalisation – is only applicable as a matter of principle rather than an adapted version to any of the above mentioned issues. In summary this approach has yielded solid although qualitative results to be extended further in the next step.

**Kilombero market (Soko la Kilombero)**

Kilombero market is located in downtown Arusha and is possibly the most important wholesale market in Northern Tanzania. The market itself consists of a wholesale and a retail section, which are physically separated. The wholesale market serves retailers and traders for Kilombero retail market as well as traders and retailers for other retail market in Arusha as well as other cities, even trading to Nairobi and Dar es Salaam is occurring frequently. The retail market mostly serves an urban customer base and it is exclusively supplied by Kilombero wholesale market.

The Kilombero market operates under the Municipal Council, which is represented by the market Director and Deputy Director. The market is divided into a wholesale section and retail section. Products are arranged on tables whereby each retailer owns a section of a width of 1.25m. The market is in operation for all days of the week. Particularly urban customers do frequent the market.

**Central market (Sokoku)**

The Central market is the main retail market in Arusha downtown. Besides vegetables many other food as well as non-food products are traded on the retail market. The retail vegetable section offers the most diverse products in the whole town and customers are typically urban inhabitants of any economic background. There is a small wholesale, rather informal wholesale section, which has a designated space twice a week from five to eight o’clock in the morning. This small but vibrant wholesale market is mostly supplied by smallholders from peri-urban areas.

The market operates under Arusha Municipal Council which is represented by the market Director/Deputy Director. The Director ensures property security and cleanliness of the market. Each retail category (Shops, Tables and Vizima) is represented by his/her chairperson to the Market Director for any social, political or economic inquiry. All products must be arranged on tables but some retailers act against the authority by-laws to arrange on grounds. The market is in operation for all days of the week.

**Tengeru market**

Tengeru market is a marketplace about 10km outside of Arusha in the sub- to peri-urban area, which is a major vegetable growing area. The market takes place once a week and besides vegetable and other food products, also non-food products and particularly clothes are traded. The vegetable exchange mainly takes place on the retail level mostly serving sub- and peri-urban customers with a rather limited purchasing power. Since market lies in a major vegetable growing area, wholesale was also observed in the peak season of certain vegetables (particularly sweet pepper, eggplant, African eggplant).
Findings part 1: Typology of vegetable value chains

Tengeru market operates under Meru District Council. The Ward Executive Officer (WEO) and Village Executive Officer (VEO) oversee and administer all activities taking place at the market, including the mode of tax collection process. The tax collection is under the WEO. The business people group elects a Chairperson who solves non-serious disputes or represents other business people to the VEO for whatever may happen at a market place.

Different from Sokokuu and Kilombero markets, most of vegetable retailers at Tengeru market display their products on the ground. The market serves people around Tengeru and Arusha Municipal who buy for their own consumption as well as for retail in Ngaramtoni and other street markets.

Ngaramtoni market

Ngaramtoni market lies 20 kilometers outside of Arusha in peri-urban to rural area with relatively low vegetable production. The market is opened once to twice per week and besides vegetables other food and non-food products are also traded.

The market operates under Arusha District Council. The Council is represented by the Ward Executive Officer (WEO) and the Village Executive Officer (VEO) who maintain the relations with business actors and are responsible for the tax collection. The WEO and VEO are responsible for solving any kind of dispute at a market place.

Few structures have been established to assist the retailers display their products so that they can have their products attractively displayed to customers. However, the other part of the market is an open space where products are displayed on ground, a situation that makes operations difficult during the rainy seasons. The products sold here are either sourced from local smallholder suppliers or from the main wholesale markets in town, such as Kilombero Market, Tengeru Market and the nearby places. The market serves people from mostly rural areas. Some limited wholesaling done with buyers taking the produce either to Arusha or to Namanga to supply to Northern Tanzania as well as into bordering Kenya.

The general structure of green markets is presented in Figure 4 below.
Products included

The green markets are the main outlet for any vegetable consumed by the urban and rural consumers. The following vegetables were reportedly traded on the above market places (alphabetical order): Amaranth, african eggplant, baby corn, beet root, broccoli, cabbage, carrot, cauliflower, celery, chinese cabbage, cucumber, eggplant, ethiopian mustard, fennel, garden peas, garlic, ginger, green bean, leek, lettuce, okra, onion, potato, pumpkin, red cabbage, snow pea, sweet pepper, tomato, and zucchini.

Although no quantitative data on the traded volumes were obtained, it largely follows the national production and consumption patterns, whereas the top three traded products are: Cabbage, onion and tomato. For our analysis it is useful to distinguish between the vegetables used in the traditional Tanzanian diet and the so-called exotic vegetable, which are generally consumed by urban and western-oriented consumers. Within the traditionally consumed vegetables the leafy vegetables can further be distinguished since they have particular production and marketing characteristics.

Traditionally consumed vegetables (non-leafy): African eggplant, cabbage, carrot, chilli pepper, cucumber, eggplant, garden peas, garlic, ginger, okra, onion, potato, pumpkin, sweet peppers, tomato.

These vegetables are responsible for the biggest part of the volume and are usually available perennial, however subject to considerable price variability. Typically, they are traded from farm gate to the consumers as individual products. Due to their relevance on the green markets the further analysis below relate to the VC of these vegetables.

Traditionally consumed leafy vegetables: Amaranth, Ethiopian mustard, Chinese cabbage, nightshade and various others.

The leafy vegetables are very important in the traditional East African diet. The leafy vegetables are both collected from wild plants as well as cultivated. Home-grown leafy vegetables for at least part of the year are very common and thus it is expected that only a relatively small portion of the consumed leafy vegetables are traded on markets. On the markets they are available as entire leaves or pre-cut and are sold in piles at constant prices and thus their size/weight changes accordingly. Their perishability is very high and thus needs to be sold quickly, often resulting in short chains characterised by high degree of informality. Besides the above-mentioned leaves, there are plenty of additional vegetables, which are, based on geographical location and season used as leafy vegetables. (Weinberger & Swai 2006; Keding et al. 2007) give a comprehensive overview on the mostly leafy, traditional vegetables.

Exotic vegetables: Baby corn, beet root, broccoli, cauliflower, celery, fennel, green beans, leek, lettuce, red cabbage, snow peas, zucchini.

---

3 A complete list of vegetables including their taxonomical as well as local names is comprehended in the annex 5 on p.118.
These “modern” or non-traditional vegetables are typically consumed by urban and rather western-oriented consumers. Thus they are only traded on the major urban markets and their overall quantity is limited and not comparable to the traditionally consumed products. Based on the little volume traded, the availability on the market is highly fluctuating during the seasons. The supply is typically originating from individual, often small to mid-sizes producers who market a variety of exotic vegetables. There are hardly any specialised collectors and traders for the exotic products and the wholesale markets do not trade the exotic products. Thus it is the individual producer bringing the exotic vegetable to the retail markets. However, the exotic vegetables are the key products in the “Institutional buyers and tourism industry” and in the “Fresh vegetables” value chains and further details and references to the trading of exotic vegetable on green markets is made in the respective chapters.

For the generalisation of the value chain profile we are referring to the traditionally consumed vegetable without the leafy vegetables for the following reasons:

- The traded volumes of the traditionally consumed vegetables are in order of a magnitude bigger than leafy vegetables or exotic vegetables.
- The actor involvement, governance structure and production characteristics of the traditionally vegetables is fairly homogenous and allows generalisation.
- The value chain of leafy vegetables are highly heterogeneous due to the high degree of informality related to their marketing (home growing, wild cultivation).

**Actors involved in the VC**

In a first step the path of the product through the green market value chain as well as the actors involved are described as illustrated in the value chain mapping in Figure 5.

![Figure 5: Mapping of the urban green market value chain](image_url)

**Producers**

The main production base originates from individual, medium to small-sized farmers. From the decision to produce a certain vegetable, over to production planning, procurement of inputs and cultiva-
tion the farmer is totally independent and thus completely bearing for all production-borne risks. For most vegetables harvesting is done by the farmer and thus the first transaction takes the form of the harvested vegetable being sold to a further agent.

Intermediaries (Traders, brokers and wholesalers)

The buyer, here referred to as the trader which is closely, often fully integrated into wholesaling. Typically it is the traders who contact potential producers to know where products are available and not the farmer who contacts the trader. Mobile phone technology is widely used in this information-gathering step and seems to have facilitated the whole process considerably. Once the trader has identified prospective producers, he then organises and hires transportation and further labour at his cost and heads out personally to collect the products. For some products like onions, the information-gathering task is further delegated to so-called brokers who may operate on their own behalf or on behalf of the trader.

The lengthy price negotiation between the producer and the trader are typically done right ahead of the transaction. The payments are entirely made in cash.

The products are then brought to the wholesale market. Thereby the transporter usually has to cover both road and wholesale market taxes. While the latter is unit-specific (e.g. TZS 500 per sack), the former is vehicle-specific and thus leads to excessive overload of the transport vehicles. The wholesale market is typically a physically confined area where wholesalers have their designated outlets. Typically the activities of brokerage and wholesaling are fully integrated and thus the trader and the wholesaler result are one entrepreneurial entity, typically an individual with some extended family members included and hired labourers. The surveyed wholesale markets were organised spatially and structurally according to individual vegetables, giving the wholesalers and their buyers, usually the retailers an easy overview on the availability and the prices of the products. As the name already indicates, the minimum quantities traded on the wholesale markets are large and form a barrier for the casual end-customer. Thus the actors making transactions on the wholesale markets are two-fold. First it is the place where the retailers buy their supply. Since the retailers usually trade in relatively small quantities it was observed that they often bulk up their procurement with colleagues and do the procurement jointly. However, the retailers are generally responsible for a considerable share of the demand. Secondly, the actors buying large quantities at the wholesale markets are the traders, which procure the produce at the wholesale market and transport and sell it to wholesale markets in other towns and cities, like Moshi, Nairobi, Dar es Salaam and others.

---

4 For some vegetables (cabbage) in certain areas it was observed that the transaction takes place before the harvest. The producer sells the right to harvest a given perimeter to a trader and thus the harvest is done by the trader.

5 In multiple interviews, producers mentioned that they „just have to wait“ for traders to arrive and the producers did not have to particularly contact prospective buyers. However, it was also reported that producers do contact traders, but only in sporadic cases.

6 The male form is used intentionally, since the wholesale and trading business is highly dominated by men.

7 The wholesale outlets in all surveyed market places were reported very scarce and it was reported almost impossible for new actors to obtain a new wholesale outlet.
**Retailers**

It is the retailers who finally offer the vegetables to the end-consumers. Retailers are typically trading relatively low quantities. The retailers usually trade a whole range of vegetable and are not specialised in individual vegetables. The formal retail markets are organised similarly to the wholesale markets, in a physical confined area, where they are provided a market stall. Besides the formal retail markets there are many small-scale casual retailers on the streets trading in the lowest quantities.

The above-described value chain structure typically refers to an urban green market value chain. In a rural context the configuration of the chain differs in two regards. First a wholesale market not involved, the produce is sold directly to a retailer on a local market place. Secondly, on rural green markets, traders were only reported in isolated cases but not as a general practise. Additionally, it was observed various times that the producer or typically a female person from the household is selling the vegetables themselves on the local green market. Overall the rural green markets are even less formalised and there is less a specialisation in marketing the produce. Figure 6 illustrates this generalised value chain for rural green markets.

The variety of vegetables traded on the rural green markets is clearly smaller than on their urban counterpart. Due to the absence of an urban clientele demanding exotic vegetables, hardly ever any exotic vegetables were available on rural market places. The products traded on the rural green markets are thus the traditionally consumed and the leafy vegetables. The supply of the products during the seasons is considerably fluctuating and the most vegetables are not available throughout the seasons.

**Figure 6: Value chain mapping of rural green markets**

**Product quality**

Throughout the whole green market value chain, there are no explicit quality specifications applied. As a general rule there is no grading of the products done. Even in cases where there is some informal grading done in the peak season, e.g. for onions and tomato, there are no clear criteria to distinguish

---

With the notable exception of areas where vegetables for fresh exports were produced and the local markets were used as outlet of reject and second-grade quality produce. Interestingly, the abundance of (second quality) green beans and snow peas due to the fresh vegetable export industry has resulted in their integration into the local diets in these areas.
between “Grade 1” and “Grade 2”. The grades are distinguished exclusively on their physical appearance and the grading decision seems to be done according to the principle “these are the nice ones, and these are the others”. The term physical appearance summarises the quality attributes specified by all actors along the value chain: Size of the vegetable, appealing colour, absence of any bruises or visual signs of pests, degree of ripening and texture.

On the policy level there is a call for improvement of the food safety situation (Jukes 1988) with the prominent and well-endowed governmental “Tanzanian Bureau of Standards” striving to implement minimal food safety specification also for vegetables (e.g. FAO’s Codex Alimentarius). However in the informal sphere of smallholders, traders and green markets these initiatives are not visible on the ground at all and do currently not have any influence on the food safety of vegetables traded through the green markets.

While product quality was hardly explicitly rewarded through grading, it was reported to be an important element of the price negotiation at any transactions. All actors involved in transactions, from producers to traders/wholesalers, to retailers and consumers, reported the importance of visual appearance of the product. Due to the lack of transparent grading the quality attributes of a product seem little rewarded and a clear price differential seems hardly obtained. The preference for appealing vegetables on the other side leads to the practise that in transactions where the produce is packaged (usually in crates or sacks) the poor quality produce gets inside and the visible part of the produce is “decorated” with appealing vegetables – a practise which is well known by the involved actors and likely does not lead to augmented trust among the trading parties.

The infrastructure throughout the green market value chain is considered very basic. Most produce is packed immediately after harvest. Most products are packaged in sacks previously used for other purposes, but these sacks – of different sizes according to the vegetables - represent the trading unit and become a commodity themselves. Thereby the size and the weight of the packaged unit are very big, e.g. 140kg for ginger, 136kg for potato 124kg for carrots, 110kg for onions, 109kg for cucumbers, 103kg for eggplants, 82kg for sweet peppers. This mode of packaging is rather targeted towards efficient handling of the bulk product rather than towards protecting the produce during the transportation. Hence part of the produce is considered buffer and the post-harvest losses at the wholesale and retail markets is considerably high.

For transportation usually small to mid-sized lorries are hired on a lumpsum basis. Therefore the trader has a considerable incentive to load the hired mode of transportation to the physical rather than the legal limit. This overloading is common practise in any transport-related domain and poses a severe road security issue and cannot be considered careful handling for a fragile product like fresh vegetables. When traders head out to the producers to buy produce, the negotiation, packing, identification of additional farmers takes hours and procurement trip may take up to two days. Together with tropical temperatures and a lack of protection against dust, rain or sun, this further contributes to the high post-harvest losses and fluctuating product quality for the consumer.

---

9 On three occasions it was reported by traders/wholesalers, that it is common practise to include products of doubtful quality or even pieces of soil or rocks in the well-hidden part of the packaging.

10 Except cabbages which are not packaged but loaded onto the lorry and traded throughout the value chain head per head.

11 Mean values based on own weighing on wholesale markets.
Both, wholesale and retail markets generally have a basic market infrastructure with shading and staff responsible for cleanliness of the market area and market stalls are rented to retailers. Active cooling by means of refrigeration is entirely lacking throughout the value chain. Overall the formal market places are generally well organised but most of them have a severe capacity problem. Not only are the market stalls very densely arranged, but the market activities typically expand beyond the initially intended market area but with little to no infrastructure and organisation. This typically starts with semi-mobile market stalls just next to the officially accredited retailers and is followed by fully-mobile baskets and blankets of street hawkers.

**Governance mode of the green market value chain**

The green market chain is characterised by its high degree of spot-market arrangements throughout the chain. There are no long-term relationship between any buyers and sellers; all transactions are made on the spot and highly price-dominated. However, the most powerful actors are easy to identify the wholesalers. In almost any case, they are buying the products at the farm gate, either on their own or by means of intermediary brokers and or traders and are marketing it on the wholesale market. The number of wholesalers is strictly limited by the wholesale market regulations (see p. 22) and the wholesale actors are very persistent with hardly any changes. Thus, it is de facto impossible for any other actor to enter the wholesale business at an established wholesale markets.

Typically the wholesalers do only trade one or two products and the wholesale market is divided according to products. This results (i) in a limited number of wholesalers per product and (ii) facilitates a rather intimate horizontal network of wholesalers. On the demand side, the buyers (most prominent the retailers) are numerous which results in a high incentive for opportunistic oligopolistic behaviour. Thus it is to be assumed that the prices are horizontally coordinated and reflected upwards by the wholesalers.

The transaction at the farm-gate between the producer and the wholesaler or one of its intermediaries is characterised by the high bargaining power of the buyer. The producer has to sell its produce in a relatively short timeframe since vegetables are a highly perishable product. As the product volumes are typically considerable, marketing the products by the producer is hardly an option and thus the producer has to sell on the spot. The buyers’ situation at the farm-gate is quite advantageous since if a transaction does not materialise he just moves on with his lorry and the staff to the next buyer. The fact that vegetable production is regionally specialised and thus spatially concentrated further aggravates the power imbalance. This again results in a high incentive for opportunistic or oligopolistic behaviour of the wholesaler, making him the price-setter. It is to be assumed that the farm-gate prices are to a high degree dictated by the wholesaler or its intermediaries.

---

12 Besides the limited space within the market area also the fact that retailers have to pay taxes on their sales does encourage the sprawling of informal trading in adjacent areas.

13 The implication of oligopolistic behaviour of the retailers was also reported in various interviews with retailers and producers.
Price monitoring at green markets

During the initial value chain appraisal it was rapidly revealed that the price fluctuation are an important feature of the green markets and a price monitoring throughout the whole field phase was established. The Figure 7 presents the tomato market prices at four retail and two wholesale markets.

Figure 7: Tomato prices at green markets

![Figure 7: Tomato prices at green markets](image)

Tomatoes were only one out of 21 vegetables monitored but here it servers as a visual illustration of the considerable price changes over time. For analysing the price volatiles in detail the coefficients of variations were calculated according to Piot-Lepetit and M’Barek (2011, p.69). Figure 8 summarises the results by vegetable and market place and type.

Figure 8: Coefficients of variation of retail and wholesale prices

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Kilombero, Retail</th>
<th>Kilombero, Wholesale</th>
<th>Ngaramtoni, Retail</th>
<th>Soko-kuu, Retail</th>
<th>Soko-kuu, Wholesale</th>
<th>Tengeru, Retail</th>
<th>Tengeru, Wholesale</th>
<th>Mean, retail</th>
<th>Mean, wholesale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onion</td>
<td>26.68</td>
<td>34.32</td>
<td>35.35</td>
<td>24.93</td>
<td>37.70</td>
<td>31.17</td>
<td>34.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td>35.22</td>
<td>46.70</td>
<td>34.50</td>
<td>31.63</td>
<td>50.92</td>
<td>62.44</td>
<td>38.07</td>
<td>54.57</td>
<td></td>
</tr>
<tr>
<td>Cabbage</td>
<td>32.17</td>
<td>34.91</td>
<td>55.15</td>
<td>123.98</td>
<td>36.38</td>
<td>48.20</td>
<td>64.87</td>
<td>35.64</td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
<td>33.94</td>
<td>48.79</td>
<td>31.45</td>
<td>28.15</td>
<td>23.35</td>
<td>48.79</td>
<td>29.22</td>
<td>48.79</td>
<td></td>
</tr>
<tr>
<td>Sweet pepper</td>
<td>111.18</td>
<td>14.74</td>
<td>24.12</td>
<td>33.21</td>
<td>63.32</td>
<td>34.05</td>
<td>53.34</td>
<td>33.63</td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td>56.98</td>
<td>59.84</td>
<td>61.35</td>
<td>54.04</td>
<td>51.99</td>
<td>56.09</td>
<td>59.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ginger</td>
<td>26.83</td>
<td>29.11</td>
<td>26.55</td>
<td>23.07</td>
<td>11.53</td>
<td>22.00</td>
<td>29.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green bean</td>
<td>24.35</td>
<td>8.27</td>
<td>21.55</td>
<td>35.39</td>
<td>48.98</td>
<td>25.79</td>
<td>35.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>30.49</td>
<td>20.05</td>
<td>35.50</td>
<td>43.45</td>
<td>23.22</td>
<td>38.17</td>
<td>27.31</td>
<td>40.81</td>
<td></td>
</tr>
</tbody>
</table>
### Findings part 1: Typology of vegetable value chains

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Mean</th>
<th>30.12</th>
<th>31.52</th>
<th>36.43</th>
<th>47.91</th>
<th>29.34</th>
<th>35.21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggplant</td>
<td>35.59</td>
<td>28.42</td>
<td>31.66</td>
<td>41.19</td>
<td>31.59</td>
<td>56.97</td>
<td>31.82</td>
</tr>
<tr>
<td>African eggplant</td>
<td>21.90</td>
<td>29.66</td>
<td>29.20</td>
<td>24.76</td>
<td>32.01</td>
<td>28.19</td>
<td>24.76</td>
</tr>
<tr>
<td>Okra</td>
<td>36.64</td>
<td>20.81</td>
<td>24.76</td>
<td>22.74</td>
<td>26.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato</td>
<td>18.68</td>
<td>25.31</td>
<td>18.19</td>
<td>28.01</td>
<td>22.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beetroot</td>
<td>16.67</td>
<td>25.32</td>
<td>16.67</td>
<td>25.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>23.87</td>
<td>35.19</td>
<td>23.87</td>
<td>35.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cauliflower</td>
<td>28.65</td>
<td>30.85</td>
<td>28.65</td>
<td>30.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celery</td>
<td>29.98</td>
<td>42.85</td>
<td>29.98</td>
<td>42.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fennel</td>
<td>15.24</td>
<td>21.67</td>
<td>15.24</td>
<td>21.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese cabbage</td>
<td>21.03</td>
<td>33.22</td>
<td>21.03</td>
<td>33.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow peas</td>
<td>16.41</td>
<td>12.63</td>
<td>16.41</td>
<td>12.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red cabbage</td>
<td>18.51</td>
<td>26.26</td>
<td>18.51</td>
<td>26.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lettuce</td>
<td>18.56</td>
<td>30.37</td>
<td>18.56</td>
<td>30.37</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The coefficient of variation ranges from 11.53 to (Ginger, Tengeru retail) to 123.98 (Cabbage, Sokokuu retail). Generally, the wholesale markets have a higher coefficient of variation (M=35.21) with a compared to the retail markets (M= 29.34). This is not only the case for the means but also for all vegetables, except for African eggplant.

For the green value chain two conclusions can be drawn from the price monitoring. First, the overall volatility of prices is high, and secondly wholesale markets have higher price volatility than retail market.

**Persistence of producers**

Cultivating vegetables is associated with several risks like climatic, agronomic and marketing-wise. This results in a considerable financial risk for the vegetable producer. The producer needs to control the production factors labour, land, and capital. Furthermore cultivating vegetables requires more knowledge on the producers’ behalf that cultivating alternative staples like maize, beans, banana or coffee. These are the barriers of entry for the producers. On the other hand most rural households in the study area are in one way or the other engaged in farming and additionally cultivating a small household garden that also includes vegetable is common. Thus the step to cultivate vegetables as cash-crop is a relatively small one considering that a producer may start with a small area and increase gradually.

Additionally there is a spatial specialisation whereby the cultivation of certain vegetables is clustered in some areas. While this is largely explained by the particular agro-climatic conditions and suitability for particular vegetables this also leads to an informal knowledge community which shares the basic agronomic knowledge and makes it easier to access the relevant knowledge and inputs.

According to the information provided by producers and traders, the production base fluctuates considerably. The typical vegetable producer has cultivated vegetables for years, but continuously adapts the area allocated for vegetable production based on past experience and assessment of the market.
Vegetable value chain in northern Tanzania

Demand. In line with the relatively high risks associated with vegetable cultivation compared to other agricultural products, numerous producers reported challenges that led them to lower their engagement in vegetable production.\(^\text{14}\) Namely, these challenges mainly referred to problems of marketability of their produce at an acceptable price and agro-climatic problems (pests, low yields).

**Seed production**

*Products included*

Due to favourable climate, fertile and abundant cultivation land, and available irrigation the area around the Mount Meru has developed a seed-producing sector of considerable size. The seed sector is divided in two entirely different business models, which hardly interoperate. One the one hand there are highly specialised and commercialised international seed producers. The main product of this sub-sector are flower seed, but to lesser degree also vegetable seeds. These flower and vegetable seeds are fully targeted towards the export market and are not available on the local markets. Their operations are highly concentrated in large enterprises with green houses and other state of the art production technology. The labour-intensive production is a source of income for many local dwellers; the management is hired internationally. Their production is typically fully vertically integrated leaving the local farmers hardly any opportunities for collaboration other than the – still welcomed – farm workers or casual labourers on the large farm estates\(^\text{15}\). Since this sector is very much a microcosm of its own having hardly any interaction with local producers and after all the cultivation area for vegetable seeds is minimal, it was decided to focus on the second sector described below.

On the other hand there are roughly a dozen small to mid-sized seed companies producing vegetable seeds for the domestic African markets. At least three of these mid-sized seed companies are subsidiaries of larger corporations based in Kenya or other African countries. The sector’s target markets are the domestic and African vegetable producers. Thus the seeds produced are first and foremost tomatoes and then in decreasing volumes sweet peppers, eggplants, cucumbers, African eggplant, and okra. As opposed to the export seeds the domestic seed is entirely produced in the fields, greenhouses are not used. Tomatoes are by far the most important seed product and the results refer mainly to the tomato seed production. However, the seed production and marketing largely follow the latter’s example.

*Actors involved*

Compared to the green markets there are only limited actors involved in the seed production value chain. The main actor group is clearly the seed companies. Most of them do control some own vegetable cultivation capacity in the form of an own farm. All of the seed producing companies cooperate with individual (rather larger) producers or groups of vegetable producers in order to scale up production, which brings us to the second main actor groups, the vegetable producers. The production mainly takes place on individual farmer’s plots under their own responsibility.

\(^{14}\) Since the research was focussing on vegetable marketing, the interviewed farmers were all engaged in vegetable production and the ones having dropped out were not reached, which is a methodological challenge.

\(^{15}\) Among the flower seed producers there were some outgrower schemes reported for individual flower seed, but this is clearly the exception.
The production of tomato seed is a fairly straightforward process whereby the tomatoes are harvested at a relatively well-ripened stadium, then the tomatoes are sorted and washed. Subsequently they are crushed usually by means of a mechanical crusher or in some cases manually by hand or foot. The resulting material contains both, the pulp as well as the seeds. The seeds are then divided from the pulp and the tomato pulp is generally thrown away. The seeds are washed again and dried.

The processing of the vegetables is done by the seed companies as well as by the producers depending on the contractual arrangement they have.

Figure 9 below summarises the involved actors and their relations.

Figure 9: Map of the seed production value chain

**Governance mode**

The seed companies buying the products can be considered the channel captains. Particularly the larger companies also operating in other African countries typically have far-reaching forward links as they often control marketing the final seed up to the retailers of agricultural inputs. However, the operations of the seed companies are highly depending on having stable relations with its producer base. Firstly they do depend on the outgrowers to reach the volumes needed since their own production area is usually quite limited. Secondly, the quality requirements are higher than for vegetables produced for the green market and thus require some augmented production and handling-related knowledge of the producers. The seed companies are thus at a powerful position and can formulate the contracts and specify the details of its content, but need to ascertain that the producers agree with the terms specified in the contract. Although there are quite some details specified in these contracts, the main content of the contract and the main cause of negotiations are the indicative price specified. Neither the producer nor the seed companies stated in any interview that any contract clause other than the price were subject of discussion or disagreement. This has to be seen in the way the contracts are perceived by both parties. Although the contracts represent a legal title, it is clear to both parties that the enforcement in case of a contract breach there will be no legal action taken. This is attributable to the fact that the sum in dispute is in most cases rather modest, and the legal practise is associated with very high costs even if a breach is legally established it is unlikely that
a seed company gets anything from a smallholder producer. There have been various cases of infringement of the written contract reported but in no single case were legal actions taken. Thus despite the fact that the contracts are in place the relation between the producer and the seed company is rather based upon mutual trust.

Quality specifications

Cultivation of vegetables for seed production requires explicit production specifications. Often these specifications are specified in the contracts. Most contracted producers are supplied with the planting material from the seed companies and in some cases the seed companies also provided the producers with fertilizer. Some seed companies employ well-trained agronomists to provide extension services to producers. The inputs provided by the seed companies which entail direct expenditures, like planting material, fertiliser, or pesticides are typically pre-financed by the seed companies and by the time of the delivery the expenses are deducted from the producers revenues. The agricultural practices are specified in some cases in great detail, not only mentioning the varieties to be cultivated, but also the amount and intervals of the fertiliser to be applied, the irrigation intervals, the pesticides to be applied and the ripening degree at which the produce has to be harvested.

While these specifications are detailed and explicit the producers seem to interpret them rather as an advice rather than as an obligation. Since the quality of the final product is assessed at the moment of delivery by visual appearance only and not by pytho-sanitary means the producers have a considerable options to cultivate the vegetables as they consider appropriate. The seed companies are well aware of this improper implementation and try to improve the quality by deploying agronomist to the outgrowers which consult the producers on appropriate production techniques. But generally the seed companies have hardly reported that the quality of the delivered vegetables was problematic. As above also in implementing the agricultural practices trust is an essential device.

Once the product is harvested, the processing is mostly done by seed companies at their processing plant. Reportedly this activity was earlier often done by the farmers but quality problems and diluting the obtained seed with seed of minor quality or with contaminants led to the concentration of the processing activity at the seed companies’. Only some tomato producers were reported to process their harvest on their own with equipment provided by the seed company.

Overall the quality specifications in the seed production value chain are explicitly stated, their application seems somewhat erratic but the quality of the final product is hardly an issue. The quality requirements for the producers are clearly above the ones for the green markets.

Transaction modalities

As it was shown above seed companies are quite integrated and typically control the value chain from the farm-gate to the agricultural input dealer. Therefore, the transaction at interest is the one between the producer and the seed company. All the seed companies operating with outgrowers use contracts to frame the transaction modalities. The most important feature of the contract is the pre-fixed

---

16 These were mostly caused by non-delivery on behalf of the producers, as a result of low yields or side-selling to greenmarkets due to high price levels on the markets.

17 The contracts per seed company are usually highly standardised documents, only adapting the personal data of the contract taker and the price and the size of the plot to be cultivated.
price. These are fixed per kg of vegetables (if the vegetables are delivered in their raw form) of per weight of seeds (if the vegetables are processed by the producers). The pre-fixed price is subject to negotiation every growing season and these negotiation seem to take a couple of weeks before both parties come to an agreement. Reportedly producers have switched to other seed companies if they were able negotiate and obtain a better price in their contract.

The volumes to be delivered are not explicitly specified in the contract but the size of the plot to be cultivated is stipulated in the contract. Thus the seed company can estimate the amounts to be delivered quite accurately since the agricultural practises are set and all producers apply irrigation, so large fluctuations seem to be the exceptions. However, it was reported by the seed companies that they were confronted with side selling – to competitors or even to green markets if the prices are accordingly – poses an issue once in a while. Due to this reason some seed companies are reluctant to provide inputs (beyond the planting material) to the producers up-front, since the seed company will not recover its investments.

**Stability of farm-gate prices**

As indicated above the prices are fixed in a written contract but subject to annual renegotiation. Producers and seed companies both reported that the prices have risen in the past few years. This might be a consequence of relatively fast growing seed industry in the study area. The sector is a rather new phenomenon but seems to have quite some growth potential. This is also reflected by the fact that there is some competition between the seed companies for producers.

To summarise, the prices per growing season are fixed and thus the price fluctuations is very limited.

**Persistence of producers**

The seed production is an emerging sector with a relatively short history. The seed companies many of them with considerable expansion plans are keen on establishing long-term relations with producers in order to secure their supply. According to the seed companies identifying, training and contracting farmers is a cost and resource-intensive task and thus the seed companies do have a considerable interest in keeping their outgrowers. There is even a competitive situation among the seed producers for contracting producers and the seed companies are well aware of their competitors’ production base and watch them closely. This competition is beneficial for the producers as it gives them options to choose from and increases their bargaining power to negotiate better contract terms, i.e. better prices. This results overall in low fluctuation of producers.

**Involvement of facilitators**

Facilitators have up to now engaged only in individual cases in the seed production value chain. The emergence of the seed sector in recent years is entirely based upon the private sector. With recent interest of donors in agriculture and high-value crops in particular has changed quite a bit. From a donor perspective a agricultural development is based upon further intensification of production and one key aspect therein is the availability of productive, affordable, and well-adapted seed and planting material. In the study area many producers (at least for the green market) are still producing their own seed, which results in often poor quality seed due to cross-pollination and out-crossing resulting in
lower productivity\textsuperscript{18}. Thus the seed sector is responsible for providing these key inputs and thus a well-managed and efficient seed sector is considered a pre-requisite for successful agricultural development.

Therefore there have been and are activities of research institutions\textsuperscript{19} collaborating with seed companies in order to disseminate new, improved and adapted varieties. The collaboration was quite successful for the research institution as it lead to an increased adoption of their varieties, but also for the seed sector who was welcoming the new varieties and were provided with base seed. However, the incentive set for the seed companies was that they perceive their role as pure multiplier of seed and hardly invest in research and development of new varieties\textsuperscript{20}. Based on the “Kilimo Kwanza” initiative of the Tanzanian government the seed sector has seen some interest. However most activities of the governmental agencies related to the seed certification processes and the seed companies not directly benefiting by these activities.

To summarise, there is some growing involvement of facilitators in the seed sectors but their interest does not focus on the business opportunity as such but rather on the service it provides – the provision of high-quality seed.

\textbf{Processed vegetables}

Although the study area is a major vegetable growing area, there is only very limited activity in processing the produce into ready-made or pre-processed foodstuffs. This may be a result of the relatively limited purchasing power of the consumers as well as the consumers’ preference for using fresh vegetables to prepare meals. So besides some sporadic, small-scale and often experimental processing like sun-dried tomatoes, only two major enterprises were identified processing vegetables in the study area. One of which being located in the Usambara mountains has just ceased activities due to cash-flow problems, our the following result are based upon the analysis of the major tomato processor in Tanzania, being Darsh Industries Ltd., located in Arusha\textsuperscript{21} complemented by an example of small-scale processing of sun-dried tomatoes.

\textsuperscript{18} While in a subsistence context it is possibly an appropriate strategy to produce its own seeds by using open pollinated varieties, the case is clearly different in an exclusively market-oriented, and capital-intensive production like vegetables where maximising the yields is the main objective.

\textsuperscript{19} This refers mainly to AVRDC’s distribution work but also the MBF-funded activities to develop the African seed sector (vBSS-Project).

\textsuperscript{20} With regard to R&D activities the Afrisem-project is an interesting case. It is a joint-venture of a European (RijkZwaan) and an Asian multi-national and large seed company that are developing improved varieties specifically adapted to the African context. Although the project advocates its development impact, it indicates that the African seed market is becoming attractive for large, international seed companies.

\textsuperscript{21} Within the framework of this dissertation a Master thesis was commissioned to investigate the potential of improved supply by local producers for Darsh Industries. The resulting study (Rüst 2011) was conducted by Jeanine Rüst under the doctoral project’s supervision and with financial support of Fintrac, an implementing agency of the USAID-funded Tanzania Agricultural Productivity Programme. The chapter on the processed vegetable value chain thus substantially draws from the results of this sub-project.
Products included

Since the processor’s main products are all tomato-based (tomato sauce and concentrate) the main products are tomatoes. Other products included in small quantities (for pickles and other products produced at low volumes) include hot chillies, onions, cucumbers, and garlic. Even though, we focus on the only substantial vegetable processor, the volumes required are not negligible. Darsh Industries processed in 2010 the equivalent of 5300t of fresh tomatoes, and in order to operate its facilities at minimal capacity a minimal daily volume of 25t is required. In 2010 roughly 40% of the fresh tomatoes processed was substituted by imported tomato paste from China. This leads to the fact that in the study area – one of the major tomato-growing area of the country – imported tomato paste from overseas is partly out-competing the local supply.

Actors involved

The principal actor is the processor, which is a fully private enterprise. It procures the tomatoes or the tomato pulp either from the producer (groups) or from the seed companies. The processing is entirely done on its processing plant in Arusha. Also the distribution and marketing is largely integrated as Darsh Industry operates an extensive network of distribution agents across the country. With its product-brand “Red Gold” Darsh Industries is the national market leader in tomato based products and also exports to neighbouring countries.

Governance mode

The processing value chain is high driven by processor itself. The processor basically controls the chain once the raw material is sourced up to the retailers. In the case of the surveyed tomato processor a strategy for further vertical integration was adopted by incorporating an own farm, which is aimed a delivering a base supply in the years to come. It is unlikely, that a total vertical integration will take place, since this would require a further diversification of the processor’s activities into farming and a considerable additional amount of land. The exporter explicitly stated to continue the collaboration with its current suppliers and increase the locally source tomatoes, or decrease the share of im-
ported paste considerably. As Ruest (2011) documents, the motivation for embracing this strategy is mainly justified by the higher quality of fresh tomatoes vis-à-vis the imported paste and to a lesser degree to an expected improved cost structure. Reportedly, the processor tried in earlier years to build up a supplier base by means of contract farming, providing agronomical expertise, and pre-funding of inputs. But according to the processor this initiative largely failed due to the high price volatility at green markets. At times of high market prices the green market (wholesale) prices are above the processors agreed prices, which creates an enormous incentive to sell the tomatoes to the green markets and thus commit contract breach. As a result the processor could not recover its up-front investments and thus is unwilling to invest again in a similar endeavour.

In the case where the tomatoes are primary cultivated for the seed production, the pulp is considered only a by-product. In cases where the seed-growing producers deliver the tomatoes to the processor for the separation of the seeds, the processor even provides a service to the actors of this non-core value chain but can obtain fresh tomato pulp at a relatively low price. Although this division of labour increases the sectors efficiency, there seems to be some dissent about the benefit sharing. The producers and the seed companies argue that the price the producers receive for the pulp hardly covers the invoked costs and repeatedly the threat was outspoken to look for alternative ways to extract the seeds and sell the pulp.

Quality specification

One of the main incentives to source local tomatoes is that with every additional processing step the quality of the final, processed product decreases. Thus fresh tomatoes are the preferred option, second would be the pre-processed tomato pulp in times of excess supply and last priority or fall-back option would be imported tomato paste.

The processor has a stated preference for certain varieties (Tanya, Marglobe and Onex) but due to its incentive to source fresh produce and the often limited availability also other varieties are accepted at times of low supply. Other quality attributes include color, texture and water content, and absence of pest. These are visually checked upon delivery at the factory and some samples are taken to cut apart and check for pest infections. From both side sporadic cases of rejects were reported, but they are rather the exception than the norm. The need to operate the production facility at capacity creates a strong incentive for the processor to also accept lower quality tomatoes, particular in times of supply shortage.

Transaction modalities

The tomatoes explicitly cultivated for processing are usually directly sold to the processor without any external trading actors involved. Selling the final processed products is then entirely done by the processor. Therefore, the transaction between the individual producer or producer group is the one of interest. Typically, the arrangement between the producer and the processor is written in a fixed contract. In this contract the amount to be transacted, the timeframe of planting and delivery, the variety

---

22 Since food processing is quite capital and knowledge intensive and entails considerable economies of scale, a strategy aiming at self-processing and marketing the pulp seems beyond the producer’s capacity.

23 During the research the processor has bought an own farm to produce some basic supply for its processing activities on its own. In this case there are of course no transactions at all involved.
or varieties to be cultivated, the modalities of delivery and, most importantly the price to be paid is specified. The indicative price either given in kg of fresh tomatoes in the case where the producer delivers the raw tomatoes.

The processor is trying to move the place of transaction from the farm gate to the factors gate; thus making the producer responsible for transportation. The processor’s practise to source the product on its own behalf seems to entail a considerable of transaction costs and is thus avoided by the processor.

**Stability of farm-gate prices**

As most supply to the processor is governed by some sort of contract with indicated prices, the room for short term price volatility is restrained. However, producers as well as the processor reported that the actual transaction price does differ in some cases from the price indicated in the contract. Reasons for this offset were twofold: First if there is a mismatch between supply and demand on the processor’s behalf the prices may be adapted accordingly. Secondly, the price level on the green (wholesale)markets influence the price to be paid for the processor. Given the high price volatility for tomato and the fact that the market channels green market and processed vegetables are fully substitutable for the producers, there is a high risk for side selling to the green market despite the contractual relation with the producer. Since contract breach has little consequences for the producer, the processor may increase its price offering in order to mitigate the side-selling incentive. However, according to the processor these price increases usually do not surpass more than 20% above the contractually-fixed prices. Compared to the green market this volatility is very low.

The contracts are renegotiated per season but usually the included prices only fluctuate little.

**Persistence of producers**

There is a base of suppliers producing tomatoes for processing, which is involved for some year. The processing business has only emerged fairly recently and thus the demand for produce was continuously high. According to the processor there is only limited fluctuation of the producers. As part of the producers are also involved in the vegetable seed chain with its high persistency and they only consider to supply the tomato pulp by product as a by-product, their high persistency also translates into the processed chain.

**Involvement of facilitators**

The processing chain has received only received limited services by facilitators. The chain is fully driven by the private-run and profit-oriented enterprise. However, the fact that a tomato processor in a major tomato-cultivating area imports roughly 60% of its tomato equivalent has given rise to serious facilitator involvement. The support services provided or planned to be provided were: Organisation of producer groups, logistical consulting and infrastructure provision, and credit guarantees for the processor.
Institutional buyers and tourism industry

Products included

The end consumers of the institutional buyers or tourism industry are urban, affluent consumers with a western-oriented diet. The main consumer outlets are the tourism industry on the one hand and the emerging supermarkets on the other hand.

Tanzania has a large and steadily growing tourism sector with its main attractions the safari business right in the study area and the beach tourism on the coast and the nearby islands. Both forms of tourism, often combined by the travellers are targeting an upper market segment with relatively high per diem expenditures. Thus, the tourism industry has high gastronomically demands which results in a steady demand for food products of high quality including vegetables. As the cuisine of tourism industry is largely following its customers, the vegetables demanded are largely what was described above (p.24) as exotic vegetables.

On the other hand retailing by supermarkets is emerging, however on a low level but with a large potential. In the whole country during the time of the study there was only one supermarket chain operating having a couple outlets in urban areas. In the study area for example there was only one single supermarket in Arusha downtown, in Dar es Salaam – a rapidly growing city with currently more than three million inhabitants – there were three Shoprite outlets and another one in Mwanza. The supermarkets target a very affluent, urban and western-oriented clientele either upper-class Tanzanians or expatriates and tourism. The supermarket chain Shoprite started out with limited product range in fresh produce and almost all of it was initially imported mostly from South Africa. Following the one-stop-shop concept of any supermarket, Shoprite introduced a larger product range of vegetables even including traditional leafy vegetable like Amaranthus. But the core vegetables sold at the supermarkets are clearly the exotic vegetables.

The value chain for the domestic restaurants and the medium to lower-end institutional buyers (hospitals, prisons, military, and others) have very distinct value chain characteristics as their procurement is heavily depending on the green markets. It is thus only referred to the higher-end of the institutional buyers and tourism industry value chain.

Actors involved

Figure 11 gives graphical representation of the value chain’s structure and actors involved.

---

24 In order to offer the tourist an „African taste“ also traditional African dishes are offered on exceptional cases, requiring some traditional and particularly leafy vegetables. However the quantities this demands rises are negligible compared to the demand put forward by the domestic restaurants.

25 The only supermarket chain operating in Tanzania was the South-African based company Shoprite. The chain has implemented a strategy to expand into the merging African economies in the past five years and has subsidiaries in various Sub-Saharan countries. While the „supermarketisation“ in Tanzania is still on a very low level, the situation is clearly different in neighbouring Kenya, where there are various supermarket operators competing for urban customers. After the field study period the Kenyan-base chain „Nakumatt“ has opened by the end of 2011 in Moshi a first large supermarket in which others are to be followed in the country. The entrance of a new competitor, and the developments in other African countries is a clear indication that this form of retailing is on the rise for, at least for a very particular, highly affluent, urban, and western-oriented customer base.
The chain’s main actors are the organisations between the producers and the customers, namely the supermarket’s procurement organisation and either restaurants, hotels or an intermediary supplying the latter. On both, on the supermarket side as well as on the tourism industry side there exist relatively complex organisational arrangements as intermediaries between the producers and the supermarket or the hotels and lodges respectively.

The supermarket’s procurement of fresh produce (vegetables and fruits) is organised by the separate company – Freshmark – that is fully owned by the supermarket chain. Freshmark Tanzania is thus responsible for sourcing the fresh produce for all Shoprite branches in the country. Freshmark operates as a wholesaler, as it offers its products not exclusively to the Shoprite supermarkets but it (i) also operates a shop where any customers may buy the products at relatively large quantities, and (ii) Freshmark has supplying contracts with various hotel and lodges.

Traditionally, Freshmark’s procurement was mainly related to importing the products from South Africa and other countries, but due to broadened product range and the high cost associated with importing fresh produce, Freshmark is trying to increase its domestic sourcing.

The producer base of the institutional and tourism is – yet – at a modest volume and its actors are quite heterogeneous. There are various small to mid-sized individual producers directly supplying to the tourism industry and Freshmark. One notable case is the large producer cooperative “Usambara Lishe Trust” which consists of several hundred producers and is located in the remote Usambara Mountains, a couple hours driving from their target markets in Dar es Salaam as well as the tourism industry around Arusha. The temperate climate, abundant water resources and favourable soils provide this remote area with a competitive advantage over other regions particular for growing exotic vegetables which many grow more favourable in temperate rather than tropical climate. This cooperative with a couple hundred producers has specialised in supplying exotic vegetables directly to the top market segment of this value chain. They do supply directly hotels and restaurants, airline-based catering services but also to Freshmark. Another example of a complex organisational arrangement is a Dutch-run large-scale farm located in Western Kilimanjaro, also a fairly remote location. Besides its traditional farming operations focusing on staples, it has started out producing vegetables specifically for tourism industry. Additionally to supplying directly to the remote lodges, they started operating an informal shop in Arusha where they are transacting some of their basket orders to customers but also
offer their products to individual customers. This outlet is popular among the city’s expatriates possibly due to the good quality of the products as well as the trust that the products are produced ecologically reasonable.

**Governance mode**

The value chain of institutional buyers and tourism is a fairly new phenomenon. It is driven by the rapidly growing tourism industry and also by the growing middle to upper class urban customers. The consumer base has higher quality expectations but is also willing to pay higher prices. Thus, the emergence of this chain is highly consumer driven. The supermarkets and the intermediary have stepped in this gap and are trying to make a successful business model out of it. Although it retailing fresh produce does not yet seem very profitable for supermarkets, it is a strategy to bring customers into the supermarkets and increase the revenue in other product categories. While there seems to be a low but steady demand for high quality products, the supply is the key challenge in this value chain. Since exotic vegetables are a fairly new crop for Tanzanian producers and cultivation of high quality vegetables requires considerable amounts knowledge and experience the supermarkets and intermediaries for tourism industry are having difficulties establishing a sound producer base. Availability in terms of amounts was reportedly the key issue. For the tourism industry the challenge is also the timing of the supply and that their orders are entirely met since they have to provide their guest with dishes at the end of the day.

This situation puts the producer in a relative comfortable position. Generally the individual smallholder producers engaged in the chain reported that selling their produce was hardly ever an issue if they were listed as one of Freshmark’s producers. Since the intermediaries want to achieve some economies of scale they would prefer to deal with larger amounts only. But due to the supply challenges, Freshmark also includes small-scale producers into their suppliers list. The deliveries of the individual producers to Freshmark are loosely coordinated by phone and if a listed supplier does not comply with the informal agreement, Freshmark delists the producer. Freshmark offers its suppliers all the same prices for the products and there is little room for price negotiations. However, the producers seem generally content with the prices offered. It is in the intermediaries interest to build a reliable producer base and thus individual cases of non- or insufficient delivery are not sanctioned be delisting.

Directly supplying of individual producers to tourism industry is being done but is associated with various challenges on both sides. The hotel or restaurant needs a relatively broad variety of vegetables and an exactly timed supply of products but the volumes are typically very low. For a smallholder producer it is hardly possible to cultivate the whole product range throughout the year, but he or she typically has a couple of individual vegetables harvesting at given time. In this situation there are two alternative strategies applied. Various and particularly remotely located lodges started cultivating their own products by establishing an own garden. This strategy requires considerable investments but also commitment since producing vegetables is not necessarily the core skill of a lodge. Secondly producers try to market their produce to various hotels and as a last resort their fall-back solution is to

---

26 The trust of consumers in the ecological sustainable production of vegetables is fairly low, particularly heavy pesticide use is a widespread customer concern among Tanzanians as well as expatriates. Based on our producer survey, interviews with extension service agents and researchers and literature this reputation is justified in at least in some cases since pesticides are heavily used in vegetable production and there is no control mechanism to assure and communicate to consumers sound production practices.
sell it on the green market. This strategy incurs high transaction costs as the time spend to identify
and negotiate transactions are considerable.

Quality specification

This value chain targets a consumer base with high product quality expectations. Besides the prod-
ucts demanded – mainly exotic vegetables – the product quality is a major requirement. The quality
attributes demanded are the physical appearance and the taste of the products. For the supermarkets
physical appearance is key and the vegetables do not only have to look impeccable in size, color and
shape but also have to be displayed in an appealing manner. While this might be the case for the tour-
ism industry to a lesser degree, the taste of products is key for upper-class hotels and restaurants
seeking to offer their guests an exquisite cuisine.

Increasingly the consumer base of the value chain is concerned with environmental and health mat-
ters and thus ecologically sound production and safe handling of the produce are other quality attributes
required. While the former two requirements are relatively easy to verify, the latter is more difficult to
control and it is rather the trust in the whole chain that the products are ecological produced and the
handling is done appropriate.

There are no explicit quality standards in place at all. At all transactions, the quality control is done
visually. Even for the supermarkets, which in industrialised countries nowadays fully implement explicit
quality standards like GlobalGAP, the application of explicit standards is reportedly not within sight.
The introduction of explicit quality standards is of low priority in an emerging market; the top declared
priority was throughout availability of products at all.

Shopping at a supermarket provides the urban consumer him with the convenience that he or she
does not have to procure their vegetables at vibrant and hectic atmosphere of the green markets. Ad-
ditionally, shopping at a supermarket provides the consumer with some timesaving as compared to
procuring on the main green markets. However, this convenience is certainly another quality attribute,
but not attached to the product itself but rather to the shopping experience.

Stability of farm-gate prices

The transaction between producer and intermediary is formalised by the supplier list of the intermed-
iciary and the prices are the same for all producers delivering. The prices are generally adjusted rarely;
reasons for adjusting are the price levels on the green markets if these products exist, general inflation.
Typically the prices are adjusted not more than once or twice a year.

Persistence of producers

The fact the chain’s main challenge is the limited and unreliable supply puts the producer at a com-
fortable position with relatively little competition. However, the demand by the intermediaries is has
high requirements with respect to quality, variability of produce, and continuous delivery over time.
These requirements are a challenge for producers. According to the intermediaries, broadening their
supplier base can be characterised as a trial-and-error process where producers start delivering and a
part of them will cease operations and return to the green market as main outlet. According to the
producers information they have all been supplying in the chain for some time allocating various degree of their production area for this purpose but most of them follow a dual strategy, where they also supply to green markets.

Involvement of facilitators

The emergence of this value chain is driven by the private sector with supermarket chains trying to enter the market and with tourism industry trying to improve their sourcing. The most prominent example of donor support is the above mentioned producer group named “Usambara Lishe Trust” which has received and continues to receive considerable support for their engagement in this particular chain. The type of support provided is broad and includes: Managerial training, agronomic expertise, market linkage support, and infrastructure provision. Neither of the intermediaries (supermarket and tourism industry) has received direct support, but by facilitating their producer base the support can be considered indirect. Overall there is both an involvement as well as an interest in the institutional buyers value chain by external facilitators with examples of considerable, albeit isolated support. Due to the (yet) very limited volume of the chain, there is only limited scope for large-scale interventions.

Fresh vegetable exports

Products included

The fresh vegetable exports value chain targets exports of fresh and semi-processed vegetables to industrialised counties. The products included into the value chain are exclusively exotic vegetables: green beans, snow peas, baby corn, and hot peppers. All produce undergoes severe quality control and grading. The reject produce is then sold to local green markets if there is a demand. Parts of the produced that have passed the quality control are subsequently loose packed into (relatively) bulk cardboard containers of 2-5kg and prepared for air-freight (mainly green beans). They are later packed into consumer-size portions or sold openly. Another part is packed into consumer-size packages of usually 250g even already containing the label of the importer ready to be put into a retailer’s shelf (green beans and snow peas). All these products were quality controlled and graded but no further processing was applied. Before cooking these products the consumer is expected to rinse the vegetables. Another part of the produce is washed and packed, either in sachets with one vegetable type or as a mixture of typically green beans or snow peas with baby corn and hot peppers. These products are fully targeted for the convenience market, as no further processing is required before cooking for the consumer.

All the above products are vegetables that are not comprehended in the typical Tanzanian cuisine and were thus traditionally not traded on green markets. Both, the supply of the emerging export vegetable industry as well as the demand of expatriates and western-oriented affluent urban customers.

---

27 This is somewhat a methodological problem since the used sampling it was hardly possible to obtain producers that have ceased operations in this value chain.

28 While maize is the most popular food crop in the area it is not consumed in its pre-mature state as vegetable but fully ripened, dried and milled as „Ugali”. Also the varieties grown for baby corn are different from the regular maize for Ugali as the former are sweeter and yellow in color. The same applies to hot pepper with is a common vegetable or spice in the local cuisine, but the varieties for export are also different ones.
led these products to become traded on local green market, albeit in small qualities and with high fluctuations on their market availability.

The vegetable export to developed country’s market is a fairly recent business model. In Eastern Africa the case of exporting green beans from Kenya is the most prominent and well-documented example (Minot & Ngigi 2004; Okello 2005; Jaffee & Maskure 2005). While horticultural exports are a multi-million industry²⁹ in Tanzania the sector is still small in Tanzania. The study area perimeter around Mount Kilimanjaro and Mount Meru are the only places where vegetables are currently cultivated for export. In the whole study area there were only three exporters operating.

**Actors involved**

Figure 12 depicts the involved actors along the value chain.

![Figure 12: Map of the fresh vegetable exports value chain](image)

The most prominent actor group in the chain are the exporters. They are pre-processing and packing the produce, and organise the transaction with the buyers, and are responsible for shipping the packed produce via airfreight to the importers overseas. These operations are highly complex and thus require considerable managerial skill and experience. Operators have high capital requirements since they have to pay both the products from the producers and the costly airfreight upfront and payback by the importers may take several weeks.

The production base can be differentiated in three different types. Two of the tree exporters in the study area have their own farm where they produce on their own and are fully vertically integrated. Both do only source part of their supply through their own farm. The supply is expanded by contracting the two other types of producers: Medium sized farms and collectively organised smallholder farmers. For the exporter medium-sized farms are reportedly the preferred mode of expanding the supply since they are capable of delivering considerable volumes at relatively little transaction costs. The abundance of mid-sized producers is limited and thus also smallholders are included into the production base. In order to minimise transaction costs, exporters cooperate with collective organisations of smallholders instead of individual smallholder producers. These organisations are formally co-

²⁹ According to FAOSTAT (2012) the Kenyan exports of fresh vegetables were USD 175 Mio in 2009.
operators. For logistical reasons they need to operate a collection centre were the products from the individual producers are collected and where the exporters fetches the produce of the whole cooperative on a weekly basis.

The importers overseas are further wholesaling the packaged products for retailing. Direct transactions from the exporter to major retailer were only reported on individual and limited cases\textsuperscript{30}. The retailers selling to produce to the consumers in the developed countries are typically large retail chains. Throughout chain, the fresh vegetables export demand a sophisticated logistical infrastructure and processes. One of the most important challenges is airfreight capacity and the capacity to handle fresh produce at the airport. Within the study area there is the international Kilimanjaro Airport (JRO), which has almost daily flights to Europe, which also offer some cargo capacity\textsuperscript{31}. In the recent years the airfreight handling at Kilimanjaro airport has been substantially upgraded and is now capable of ensuring a state-of-the-art cold-chain. Since the larger cut-flower industry is also using the airport, and the relatively heavy vegetables are a suitable complement to the light flowers to get the weight-volume-ratio of the airfreight right, both industries have a joint interest in an increased airfreight capacity at JRO. Besides the limited capacity at JRO also the prices seem comparatively high and all vegetable exporters (as well as most flower exporters) were also using the airports at Nairobi as well as at Dar Salaam for their shipments\textsuperscript{32}.

**Governance mode**

The fresh vegetable export value chain is highly driven by retailers in the developed countries. The demand and the willingness to pay by consumers for all-year-round availability for vegetables have pushed the retailers to source the respective products from different climatic zones. The logistics involved in chain are considerable as fresh vegetables are highly perishable and airfreight is hence required. This sourcing practise implies that the up-stream part of the chain is in a globally competitive field and is subject to global trends and fluctuations\textsuperscript{33}. In this perspective, the emergence the fresh vegetable export in Northern Tanzania is to be conceived as an expanding and location-diversification strategy of the Kenyan horticulture export industry. Northern Tanzania provides good opportunities as an alternative production location (good soils, temperate climate, low labour cost, available irrigation).

Hence all three exporters are directly or indirectly linked with the Kenyan horticultural export industry by either directly collaborating with or at least using its infrastructure by shipping parts their produce through the Nairobi facilities.

The existing producer base for export vegetables is thus a direct result of consumer demand in the industrialised countries. With regard to production and bulking the produce, the exporters are the

\textsuperscript{30} Since the large retailers who do have direct relations with producers require considerable volumes, they tend to collaborate with larger exporters. The three exporters in the study are all either mid or small-scale.

\textsuperscript{31} At the time of the study only the carrier KLM was offering cargo through their scheduled flights. Two years ago, there was a weekly light, exclusively for cargo.

\textsuperscript{32} Reasons given for the high prices were the limited economies of scale, lack of competition (only one airline offering cargo) and generally high costs at JRO.

\textsuperscript{33} A remarkable example of this vulnerability was the disturbance of European air-transportation due to an ash cloud following the eruption of an Icelandic volcano in April 2010. The exporters were not able to air-freight their products and thus had to dispose large parts of their products. The exporters passed on part of the reduced demand by not accepting any more deliveries of products from the contracted producers.
main actor group on-ground. The establishment and organisation of producer groups for export vegetable cultivation was fully induced by the exporter’s initiative. The exporter is responsible for matching the sourcing requirements of its buyers and has thus established fairly complex organisational structures. The producer is responsible for cultivating the products according to the specification provided by the exporter.

Quality specification

The quality specifications are entirely set by the retailer in the developed countries. As most of the retailers are or already have moved to the implementation of GlobalGAP this standard becomes the de-facto specification for production. All three exporters reported that they are under pressure by their buyers to implement GlobalGAP for their entire output. However, there seems to be a transition period, where exporters are asked to provide the certificates but also uncertified produce is accepted. In the long run it is widely anticipated that GlobalGAP certification will become a requirement when supplying in the fresh vegetable export chain.

The GlobalGAP-standard is a very detailed production and quality specification that is based on Hazard Analysis and Critical Control Points (HACCP) and is implemented by means of good agricultural practises. Certification is subject to initial and recurring auditing, which is either be done as individual producer or in case of smallholder producers as a group where the group’s activities itself as well as a sample of the producers are audited. Besides the agricultural practises to be followed it implies for the producer and the exporter extensive documentation of all activities. Particularly its requirement for full traceability results in a logistical challenge upstream as it implies that every selling unit is fully traceable to the plot where and when it was cultivated.

Since the fresh vegetables exports are sold to the consumer at a relatively high unit price, the expected physical and phyto-sanitary attributes are very explicit. For the exporter this means a thorough quality control (size, shape and color as well as pests) and results in regular rejects, which are accounted to the individual producer. The exporter has a high incentive to ensure the given specification since rejects on behalf of the importer are disposed without compensation and the exporter bears the high airfreight expenses of the rejects. The farmer are sorting out products not meeting the specifications during harvest and either consume it themselves or try to sell it to the urban green markets. Rejects by the exporter are transported back to the producer for feedback and transparency reason.

The exporter’s activity of sorting, grading, quality control, rinsing, packaging and documentation are labour-intensive. Hence the chain provides employment opportunities beyond the production and the exporters are hiring a considerable labour force, which consists of predominantly female workers.

Transaction modalities

The transaction between the producer and the exporter is specified with contracts. The contracts are specified by the exporter according to the specifications of its buyers. Mid-sized, producers are contracted individually; producer groups are contracted as a group and do have to organise internally. The content of the contracts are extensive and two of the three producers include a roughly one hundred page growing manual as integral part. However, the many contract clauses are intended to provide the high product quality required by the exporters and the contract is enforced by two means. First and foremost, by quality checking and possible rejecting of the produce by the exporter and secondly by the audit for GlobalGAP certification by an independent audit and certification agency. The
most important and binding elements of the contracts are the price of the delivered products and plots identification and sizes on which the produce is to be planted. These are the clauses which are modified when the contract is renewed with is done for every growing cycle.

Reportedly, the rejects used to often form an issue of dispute. In order to increase transparency and mitigate this conflict, the exporters tend to send rejects back to the individual producers so they can check on the exporter’s reject decision.

As the chain is externally driven and demand is growing and the production base is limited there is competition among exporters for producers, which puts the producer in a favourable negotiation place. However, the room for price negotiation is limited since the exporters are well aware of their competitors’ prices and their margin is limited by the high airfreight costs.

**Stability of farm-gate prices**

Prices for the fresh vegetables paid to the individual producers are fixed in the contracts and are thus highly stable. As a matter of fact all exporters reported, that they apply the same rates all-year-round, so no there is no seasonality of farm-gate prices. When the contracts are renegotiated for a new planting season, there might be some minor increase but overall the stability of the farm-gate price is very high.

**Persistence of producers**

As it was shown above, the requirements for the producers to be part in the fresh vegetable export value chain are high in terms of agronomical knowledge and skills and collective organisation and co-ordination need both horizontally and vertically. This translates in relatively high barriers of entry for new producers, which partly explain the unmet production potential aimed by the exporters. Also for the exporter, the required investments in their producer (collectively organising, setting up collection centres, training producers) are high and only profitable, if the collaboration has a medium to long-term perspective. Thus the exporters have a strong interest in establishing durable relations with their producer base.

As reported by the producers as well as by the exporters, the producers involved in fresh vegetable exports generally produce for years and relatively small drop-out rates were reported. While it was reported that individual producers left a producer group, the groups were in most cases able to recruit other producers and producer groups as a whole were hardly ceasing their operations. However, there seems to be some fluctuation between the exporters the producers are delivering to, and some swapping takes place.

There is a general contentment and respectively a relatively high level of trust between the producers and the exporters. However, the incident of a bankruptcy case in 2008 where the large fresh vegetable exporter “Gomba” ceased down its operations and hundreds of producers were not paid their consignments puts (some) producers’ trust in perspective and illustrates the vulnerability of the producers towards (the many) external factors which are embedded in this global value chain.
Involvement of facilitators

The fresh vegetable export chain has received considerable interest from academia (e.g., Steve Jaffee & Maskure 2005; Dolan et al. 1999; Barrientos et al. 2003; Battisti et al. 2009) and donors. For academia, the value chain presents an interesting study object, since it is a fairly new and emerging phenomenon with many interdependences between the local and the global and complex configurations. For donors, the emerging value chain represents a new business opportunity with potential income-generating activities and specifically the aspiration to provide smallholder producers access to an emerging business activity. Additionally, the chain has a donor attractiveness due to its independence from other, local value chains which eases interventions.

The facilitators’ involvement includes all actors from the production downwards to the shipment:

- Producers: Agronomic training, facilitation of collective organisation, facilitation of GlobalGAP certification, provision of infrastructure (collection centres cold storage)
- Exporters: Credit loans, facilitation of producer group organisation, provision of infrastructure
- Airfreight: Organisational capacity building, credit loans.

Thus the fresh vegetable export value chain is clearly the chain receiving the most facilitation by international donors.

5. Interpretation

Based on the results presented above, the initial research questions are revisited and answered individually.

Research question 1: Types of vegetable value chains

The research has shown that a multiple value chains with different characteristics prevail and co-exist in the vegetable sector. The methodology applied was instrumental to analytically differentiate value chain types. The result of this exercise is a typology of vegetable value chains, comprising of five types. Namely, (i) rural and urban green markets, (ii) seed production, (iii) processed vegetables, (iv) institutional buyers and tourism, and (v) fresh vegetable exports.

The following Table 4 below summarises the main characteristics of the value chain types developed in the results section.
The results demonstrate that there are multiple value chains with very different configurations. In terms of volume the traditional and well-established green markets are by far the most important chain. However, there are also alternative chains emerging with often more sophisticated configurations. While these chains are all still small in terms of volume, they do seem to have a considerable growth potential. This growth potential provides opportunities for particular actors, since the chains have very distinct requirements than the default green market. It is unlikely that these niche markets will threaten the existence of the green markets as a whole. Rather, the emerging chains are to be seen as complementary chains with higher requirements, most prominently the quality specifications itself and the reliability to deliver the product quality on the producer side. While the green market chains are well and since a long time established, the emerging chains are clearly more of innovative nature. Since the

<table>
<thead>
<tr>
<th>VC type</th>
<th>Rural and urban green markets</th>
<th>Seed production</th>
<th>Processed vegetable value chain</th>
<th>Institutional buyers and tourism industry</th>
<th>Fresh vegetable exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables included</td>
<td>Individual products</td>
<td>Individual products</td>
<td>Individual products</td>
<td>Product baskets on demand (small amounts of many different veggies)</td>
<td>Individual products or multitudes of products</td>
</tr>
<tr>
<td>Governance mode</td>
<td>Spot-market</td>
<td>Contract farming with often repeated contracts</td>
<td>Informal contractual farming, complemented by spot-markets</td>
<td>Relational network, complemented with spot-markets</td>
<td>Vertical integration, complemented by out-growers schemes</td>
</tr>
<tr>
<td>Product quality</td>
<td>Visual appearance, but little quality specificities required</td>
<td>Product quality and agricultural practices defined</td>
<td>Varieties specified; quality requirements relatively low</td>
<td>Visual appearance important proxy for quality, no particular quality standards required</td>
<td>Quality standards required, good agricultural practices audited</td>
</tr>
<tr>
<td>Stability of farm-gate prices</td>
<td>High fluctuations</td>
<td>Low fluctuations, usually fixed in contracts</td>
<td>High fluctuations</td>
<td>Relatively low fluctuations, fixed prices</td>
<td>Contracted farmers receive the same price all-year round</td>
</tr>
<tr>
<td>Persistence of producers</td>
<td>High fluctuations</td>
<td>Low fluctuations</td>
<td>Medium fluctuations</td>
<td>Low fluctuations</td>
<td>Low fluctuations</td>
</tr>
<tr>
<td>Involvement of facilitators</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Main challenges</td>
<td>High-post harvest losses, high price fluctuations</td>
<td>Reliability of supply: Volumes, quality, timing</td>
<td>Reliability of supply: Volumes, timing</td>
<td>High coordination costs: weekly delivery, reliability of supply: Volumes, timing</td>
<td>Standards (GlobalGAP, BRC required) Reliability of supply: Volumes, quality, timing</td>
</tr>
</tbody>
</table>

Table 4: Overview of characteristics of each value chain type
alternative chains are in most cases closely intertwined with the green market, there is the possibility that some of the innovations (e.g. producer organisation, agricultural practices, product differentiation) will eventually also influence the green market again.

Research question 2: Actors involved

Based on the value chain mappings the actors and stakeholders of all value chains were identified. Namely, the following actor categories were differentiated:

1. Input suppliers: Providing agricultural inputs like seeds, fertiliser, pesticides and farming equipment
2. Producer: Responsible for the cultivation of the vegetables
3. Intermediary (Trader/Broker): An agent buying and selling vegetables between farm-gate and retail outlets. While a trader owns the product at a certain time, the broker does at no point in time own the product but operates on another actor’s behalf
4. Transporter: Responsible for the transportation of the vegetables from one location to another without owning the produce
5. Processor: Processes the fresh vegetable into a processed foodstuff.
6. Exporter: Buys fresh vegetables for pre-processing and exporting it to industrialised countries.
7. Wholesaler: An agent buying fresh vegetables and selling them at a wholesale market in relatively large quantities.
8. Retailer: An agent buying fresh vegetables and selling them at a retail market to consumers in small quantities.
9. Consumer: The final point of destination of a vegetable

The actor categories involved vary greatly between value chains and even within a chain type depending on local specificities and products involved. Due to the nature of vegetables as a cultivated plant for nourishment producers and consumers are involved inherently. However in all value chains identified, at least one agent is involved in linking producers and consumers. The analysis of the involved actors has shown that all value chain types are governed by an intermediary between the farm-gate and the consumer. Most prominently in the green market chains, the wholesalers are clearly the channel captains. Certainly their role as channel captains potentially puts them into a position for opportunistic rent-seeking. However, their function in matching demand and supply of the green market is crucial for the whole vegetable sector and their role is hardly to be underestimated. Thus, any strategies for value chain upgrading in the green market have to take the importance and the dominance of the wholesalers and their intermediaries into account.

34 Only on the rural (and to a lesser degree also urban) green markets some direct sales from producers to consumers were observed either by selling directly to neighbours or by retailing the produce on the green market.
Research question 3: Governance modes

In the theoretical part we have introduced and developed the concept of governance modes based on the work of Williamson and further developed by Menard. The later distinguishes between markets and hierarchy and the in-between the hybrid forms of governance resulting in the following governance modes: (i) Markets, (ii) trust-based, (iii) relational network, (iv) leadership, (v) formal government, and (vi) hierarchy.

According to Menard the mode of governance is then a function of the transaction cost and the specificity of the assets involved in the transaction. As we have presented the mode of governance for each value chain in the results section, they can be incorporated into Menard model of governance. The green markets with their high-degree of spot-market arrangements clearly relate to the “market” form of governance. The processed vegetable chain is considered between market and the hybrid form of trust based; the seed production re-lates to the governance form “trust-based” or “relational network”. The institutional buyers and tourism chain follows the patterns of a relational network. And the fresh vegetable exports are at the threshold between hybrids and hierarchy.

Figure 13 below illustrates the classification of vegetable value chains in Menard’s model of governance.

Figure 13: Governance modes of vegetable value chain

Thus the vegetable value chains identified can be ordered on a continuum from market to hybrids to hierarchy. Taking into account the results of the chains quality aspects and price fluctuations, it can be observed that with increasing reliability of product quality and decreasing price fluctuation respectively, the mode of governance tends to move along the continuum from market to hierarchy. Since Menard’s
typology was considered an instructive conceptual model but difficult to operationalise other, less-abstract indicators than asset specificity like reliability of product quality or price fluctuation might be used as proxies.

**Research question 4: Transaction characteristics**

The transaction characteristics highly differ depending on the value chain type. Basically there are the two extreme cases and the others are somewhere in between: The green markets are throughout the chain dominated by spot-market transactions. On the other side is the fresh vegetable export chain, which is characterised by either complete vertical integration or at least a high degree of close and repeated cooperation between the actors.

The transaction characteristics at the farm-gate of all other value chain types are between these poles. Their transactions can be characterised by the following elements.

First, they all include to some degree contractual arrangements. These may be formalised in written contracts in most cases (seed production, processed vegetables) or consist of an oral agreement (institutional buyers and tourism). The content of the contracts typically include volumes to be delivered, indicative prices and in some cases some production and quality specificities. However, due to the fact that supply in these specialised chains is relatively scarce, the contract enforcement is weak. Additionally, the complexity of the legal system and the often relatively small monetary value of the contract set a strong incentive that contract breach is hardly ever prosecuted. Since both parties of the contract are well aware of this setting, the contracts have the role to explicitly formulate the rough transaction modalities. The transaction is thus rather based on the mutual trust of the parties involved, which is usually founded on long-term relations with repeated transactions.

Secondly, the green market represents the fall-back option for all other chains. The traded volumes of most vegetables at the green market are considerable and in most cases are capable to absorb additional volumes35. The high price volatility on green markets thus provide a substantial incentive for producers to direct their produce to the green markets in times when the prices in the green market chain are above the one fixed in the contract. Thus, side-selling is a often reported reason for contract breach and break-down of mutual trust.

The green market chain clearly represents the default chain and as fall-back of most other chains it represents the backbone of the vegetable sector. While the other chains are currently considered niche markets with a considerable growth potential it is unlikely that the green market chain will loose its relevance or change structurally completely. Although the spot-market transactions in the green market chain entail some inefficiencies – most prominently the incentive for oligopolistic and oligopsonistic behaviour on the wholesalers behalf –they do have advantages over the coordinated or integrated transactions. Most prominently, the spot-market arrangements are capable of balancing the greatly fluctuating supply of seasonal vegetables although at the price of high price volatility. Additionally, the assets involved in the transactions are low and generally, the barriers of entry for a producer to supply to the chain are at an absolute minimum.

---

35 At least this holds true for all traditional vegetables. While all exotic vegetables are also traded on the greenmarket, its absorbing capacity is limited due to the small consumer demand. So it would be hardly possible to direct the whole produce of the exporters to the domestic green market and even relatively modest volumes will negatively affect the price on the green markets.
Research question 5: Food safety and food quality requirements

The minimum food safety requirements in Tanzania are theoretically given by FAO’s Codex Alimentarius with the Tanzanian government adheres to and implements it by the Tanzanian Bureau of Standards. However, outside the bureaucracy the standards and regulations for vegetables are hardly known and even to a lesser degree implemented. In spite of the existence of stringent food safety regulations, they are largely irrelevant for the vegetable sector and consumers since enforcement is completely lacking. Therefore, the relevant topic is rather the food quality attributes required within each type of value chain.

The green market has clearly the lowest quality requirements. Hardly any grading and quality differentiation is done throughout the chain. Quality attributes exclusively refer to physical appearance (color, shape, ripeness). Since grading is largely lacking, product quality is not directly rewarded by an augmented price. However, it is reported that the quality attributes form part of the transaction negotiation at the farm-gate. Since the wholesaler will not be able to fetch an increased price for high quality produce, it is to be assumed that the quality argument is primarily used at the detriment of the producer when the quality is low. Additionally, the large trading units favour opportunistic behaviour on behalf of the farmers by displaying the nice-looking products on the visible part and packing the inferior produce underneath. Overall quality in the green market chain is hardly rewarded and there is no minimum quality specification.

Overall the quality specifications in the seed production value chain are explicitly stated, their application seems somewhat erratic but the quality of the final product hardly poses an issue of conflict. The quality requirements for the producers are clearly above the ones for the green markets.

The food processing chain has particular quality requirement since the quality of the raw product affects the quality of the end product. However, in the studied tomato case the principal quality matter was already the preference of the processor for locally-sourced fresh tomatoes over imported tomato paste. Although sporadic rejects based on the lack quality specification of the fresh tomatoes (ripeness, water-content, pests) were reported, the buyers are rather tolerant since they have a processing plant to operate at capacity.

The institutional and tourism chain’s quality requirement are mainly referring to an impeccable appearance of the visual attributes. As environmental and health considerations are an emerging topic of affluent consumers, environmental sound production and handling becomes an issue. Since the production base of the sector is limited, the informally demanded quality is hardly implemented. Supermarket and restaurants have to accept the available supply even if it is sub-ideal quality.

The fresh vegetable export chain has clearly the most stringent quality requirements. Not only are they specified in great detail in the contracts but also the exporters execute strict quality control with considerable reject rates. The produce is checked visually upon delivery to the exporter for several criteria. The reason for this strict quality control is that the exported vegetables are again and any rejects there carry the high cost of the shipping charges, which are above the whole production costs. The standard GlobalGAP is generally required albeit not comprehensively implemented. In the mid to long run, compliance with GlobalGAP will become a necessity for participation in this value chain.

Generally, the product quality requirements are rising from green markets to fresh vegetable exports. While in all value chain types, certain quality attributes are a nice-to-have feature, the application of
quality control and actual rejects are a feature of the more sophisticated chains. Thus for the producer this results in need for increased reliability of the quality of its produce.
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

1. Introduction

1.1. Research interest

The research in this chapter summarises two distinct topics, which are highly intertwined, namely smallholder participation and collective action. In the following the problem formulation, hypotheses and research questions as well as the interpretation are structured accordingly.

Problem formulation

Smallholder participation

According to the literature, there is evidence that smallholder participation in high-value vegetable supply chains is possible and provides opportunities for income gains and improvement of livelihoods. However, it is assumed that participation in high-value supply chains is not a panacea for every smallholder, but requires a specific set of assets.

This problem statement leads to the formulation of the following hypothesis:

Hypothesis 2: Smallholder participation

Long-term participation of smallholder farmers in high-value supply chains is achievable, potentially profitable and improves the livelihoods of smallholders’ households.

Participation of smallholder farmer groups is easier to achieve in domestic value chains than in export-oriented value chains.

Collective action and entrepreneurship

Vegetable cultivation is highly labour-intensive. Smallholding producers have a comparative advantage in (i) accessing and monitoring unskilled labour and (ii) have the required necessary local information.
Larger producer have comparative advantages in many other respects (e.g. market knowledge, skilled labour, technical knowledge, input purchase, financial services and capital, QA and traceability, risk management).

Pooling the limited resources of smallholders might be a promising strategy in achieving economies of scale and scope further down the chain. Collaborations of smallholder with larger agricultural enterprises could possibly yield benefits for both parties since their comparative advantages could be combined. Entrepreneurial spirit is key for the establishment of any collaboration with the agri-business.

The according hypothesis is formulated as follows:

**Hypothesis 3: Collective action and entrepreneurship**

Collective action and collective organisation is a potential strategy for smallholder producers to access high-value vegetable supply chain. The decision to engage in a form of collective action is based on the smallholders assessment of costs and benefits of the collective action initiative.

Potential benefits include: Increased efficiencies in procuring and accessing the agricultural inputs, lowered transaction costs in marketing the product, improved access to high-value supply chains, increased negotiation power, increased access to R&D, and political advocacy.

Potential costs include: Loss of independence (individual decision power), and governance cost (time and funds) of collective organisation.

Collective action and organisation of smallholder producers might be enabled by an entrepreneurial spirit of a key actor in the supply chain.

**Research questions**

The above problem and hypothesis formulation leads to the following research questions, which are addressed in this chapter:

**Smallholder participation**

2.1. Of what nature is the smallholder participation in vegetable value chains, and which is the asset base of both the successful and the unsuccessful smallholders?

2.2. Which types of vegetable supply chains do best correspond with a typical smallholder’s asset base?

2.3. How profitable is participation in various vegetable value chains for smallholders?

2.4. Has participation in vegetable value chains led to increased income and improved livelihood on the household level?
Collective action and entrepreneurship

3.1. What are the modes of operation of the vegetable smallholders? How are they embedded in their value chain?

3.2. What type of collective organizations are successfully working and what are their success and failure factors in vegetable value chains?

3.3. What are the costs and the benefits of collective action and collective organisation?

3.4. How has the collective action and organisation emerged and what was the role of entrepreneurship?

2. Theoretical background

The key concept of the value chain was already discussed in the previous chapters and is not repeated here. For the analysis the capital types according to the sustainable livelihood approach are used and described below.

2.1. Sustainable livelihoods approach

The present study focuses on the participation of smallholders in particular value chains as a mean to improve their livelihood. Hence, the widely used sustainable livelihood approach (Chambers & Conway 1992; Scoones 1998) represents a suitable analytical tool for conceptualising potential livelihood strategies of actors. Although the sustainable livelihood approach has its shortfalls – namely as it addresses knowledge, politics, scale and dynamics only partially (Scoones 2009) – it is an adequate instrument for analysing the strategies of smallholder farmers to access vegetable value chains. The basis of the livelihood approach is that actors are embedded with various forms of capital. One of the aims of the survey is to assess the capital endowments (assets) livelihood assets of the producer households. Thereby the sustainable livelihood approach was chosen and for each capital type respective indices were created.

3. Methods

3.1. Outline of surveys

In order to validate and extend the results from previous chapter, a set of quantitative surveys was conducted. Each of the surveys is described below.
Producer survey

The producer survey represents the main data source for answering the research questions. The survey is designed to yield empirical, quantitative as well as qualitative data on the producing actors of the value chains. Specifically, the producer survey comprehends the following sections:

- Demographics of producing household
- Asset base and livelihood assessment
- VC integration and transaction modalities
- Profitability of vegetable cultivation
- Collective organisation
- Donor involvement

The full producer survey is comprehended in Annex 5 (p.126).

Sampling

As the survey is an instrument to further elaborate the findings of the previous chapter, a respondent-driven or snow-ball sampling approach (Salganik & Heckathorn 2004) was chosen. Initially a stratified and randomised sampling was considered, but rejected for the following reasons: (i) The feasibility of identify the main population was not given (no register of producers, spatial sampling of little use since vegetable cultivation is spatially highly concentrated and additionally no such spatial data was available). (ii) Production of multiple vegetable crops and for multiple value chains synchronously and sequentially is common and thus any stratified randomised sampling would yield little targeted success. (iii) The sampling incurred considerable cost in time and travel expenditures and contacts with respondents had to be established in advance. With the widely used mobile phones it was possible to get in contact with the potential respondents ahead of the interview and properly organise multiple interviews in a given area. As entry point into the networks the contacts from various value chain actor types of the value chain tracing (p.19) were used.

Wholesale and retail surveys

The surveys had the objective to yield quantitative data on the vegetable value chains at green markets. The survey targeted to answer the following research questions:

- Stakeholders: Which actors are involved in the green markets as well as within the value chains of each vegetable?
- Vegetable types: Which vegetables are traded by whom? What is the rationale to chose the vegetables traded?
- Sourcing: Where are the vegetables usually sourced? Which transactions are made on the market?

Prior to the quantitative survey the above markets were visited and qualitative interviews with key stakeholders were conducted in order to get an understanding of the markets operations and its organisational structure. Additionally, the information obtained from the value chain analysis (Findings chapter 1) was used to design the survey. The survey was pretested on each market place and slightly revised subsequently. The pre-test data has been excluded from the analysis.
The markets analysed were the main green markets in and around the city of Arusha. These markets represent the default value chain for vegetables. Complementary to this market survey we are monitoring the price levels for a vegetable basket on each of these markets on a weekly basis in order to have baseline data for comparison with all other value chains.

The following four markets are included:

- Sokokuu (Central market): Mostly a retail market at the city centre (Urban retail market).
- Kilombero: Mostly a wholesale market at the city centre (Urban wholesale market).
- Tengeru market: A mostly retail market at the periphery (10km from the city centre), in a major vegetable cultivating area (peri-urban market).
- Ngaramtoni market: A retail market outside the city (15km from the city centre) in rural area with relatively little vegetable cultivation (peri-urban to rural market).

**Sampling of respondents**

The survey is targeted towards the actors being involved in transactions of vegetables on the market places. Therefore the respondents will be twofold: Retailers and wholesalers.

The survey aims at obtaining specific information on the transactions on green markets, therefore a randomised sampling of respondents is chosen. On the retail markets each retailer or wholesaler is allocated a defined space. We aim at obtaining 20 respondents for each market and thus we will count and map the market participants. The number of market participants was divided by the sample size (20 respondents) and the resulting ratio is used to consecutively sample the respondents according to the mapping, e.g. if there are 100 market participants, every fifth on the map was being interviewed.

The sample size for the retail survey is N=57 (actors) and N=123 (products) for the retail survey, the sample size for the wholesale survey is for actors and products both N=40. The full survey is comprehended in annex 7 (p.130).

### 3.2. Methods used in analysing the data

Maximising the individual or household-level utility is a basic assumption of any neo-classical economic foundation. This also applies to smallholders, and since vegetable production is typically an intensive cash crop incurring considerable investments and risks the assumption of maximising profitability is a reasonable assumption for vegetable producers (Schipmann & Qaim 2011). As indicator for profitability the relative gross margin is used. The relative gross margin is defined as ratio of the revenues and the direct costs. This measure is used as the dependent variable in the below mentioned analyses.

Besides regular descriptive statistics correlations were extensively used for data analysis. Thereby it is to be noted that the later do not imply causality but rather statistical relation. Furthermore three more complex statistical methods were used in analysing the data: Principal component analysis (PCA) for discovering latent variables and creating various indices, cluster analysis for characterising the farmer households, and multivariate modelling was used for identifying the predictors of the gross margin.

To assess the capital level of the producers an index was established for each capital type (natural, economic, human, and social). The use a principal component analysis for creating wealth indices is a
standard procedure (Vyas & Kumaranayake 2006) and according to Howe et al. (2008) produces consistently better results than equal weighted indices. The indices were calculated based on a principal component analysis with varimax rotation. In order to assess the suitability for the application of a PCA the Kaiser-Maier-Olkin (KMO) and Barlett’s test of sphericity were used. The KMO needed to above 0.5 and the significance of the Barlett’s test below p=0.05 (Field 2009). The indices were calculated for each capital type using the average of the (squared) z-scores of the respective variables. Due to limited amount of variable included into the indices all solutions provided only one factors thus limiting the potential disadvantage that arise from only using the most relevant factor.

To assess the material wealth of a producer a household-item-index (Barham 2007) based on Guttman scaling (Guest 2000) was calculated. The data was taken from the producer survey where the farmers were asked which items they possessed. The items given as choice were such as they could be used to improve farming productivity or marketing performance. Namely the items were bicycle, car, cart, hand hoe, mobile phone, motorcycle, oxen plough, processing machine, radio, television, tractor, and truck. The obtained unidimensional scale used for assigning the index values has a sufficient coefficient of reproducibility of 0.87.

Two distinct sets of multivariate models are constructed to assess the predictors of the gross margin of the respondents included into the producer survey. The variables used in the regression model 1 and 2 were obtained from the capital endowment indices described above and complemented by the value chain type in integration for model 2. Model 3 and 4 were based on individual variables complemented by the value chain integration (model 4).

Finally, for classifying the producers a cluster analysis was conducted, which is an suitable method to characterising farmers (Bidogeza et al. 2009). The algorithm used was the two-step cluster analysis, the distance measure was log-likelihood and the clustering criterion was the Schwarz bayesian criterion.

All calculations were done in SPSS (20) except the household-item-index was calculated with Anthropac and directly in the data repository (Filemaker Pro 11).

4. Results

Subsequently, the results from the surveys are presented. First the gross margins of the green markets are analysed. Subsequently, the gross margins of producers according to their value chain type are assessed, followed by the determinants of smallholder integration into value chain types. Finally, the collective action of producer is analysed.

4.1. Gross margin analysis at green markets

As shown in the findings chapter 1, the green market chain clearly represents the default marketing option as well as the potential fall-back option for any vegetables. Thus, in order to assess the mode of operation of the vegetable value chains and their efficiency, first the gross margins on the default
green market chain were calculated and secondly the distribution of income along the value chain are assessed.

The gross margins for the local and urban green markets were calculated for the three main transactions along the green market value chain, which are (i) the farm gate between producers and wholesalers, (ii) at the wholesale market between the wholesalers and the retailers, and (iii) at the retail market between the retailers and the consumers. For each of the three transactions data from the dedicated surveys were used to assess the revenue and cost incurred at every step. The gross margin is defined as the difference between the revenue and directly incurred costs of the transaction. The gross margin is expressed as the percentage of the pertinent selling price. The results are presented in the table below.

Table 5: Gross margins at green markets

<table>
<thead>
<tr>
<th></th>
<th>Retail Study</th>
<th>Wholesale study</th>
<th>Producer study</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (actors)</td>
<td>57</td>
<td>40</td>
<td>(134)</td>
</tr>
<tr>
<td>Sex (male/female)</td>
<td>28.1% / 71.9%</td>
<td>62.5% / 37.5%</td>
<td>82.7% / 17.3%</td>
</tr>
<tr>
<td>Other sources of income</td>
<td>84.2%</td>
<td>22.5%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Years experience</td>
<td>M=6.65</td>
<td>M=5.93</td>
<td>M=10.32</td>
</tr>
<tr>
<td></td>
<td>SD=4.61</td>
<td>SD=4.76</td>
<td>SD=9.04</td>
</tr>
<tr>
<td>Number of vegetables trading</td>
<td>m=2.666667</td>
<td>m=1.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SD=1.648</td>
<td>SD=0.543</td>
<td></td>
</tr>
<tr>
<td>N (products)</td>
<td>129</td>
<td>40</td>
<td>142</td>
</tr>
<tr>
<td>Gross Margin in %</td>
<td>M=41.14</td>
<td>M=21.49</td>
<td>M=71.12</td>
</tr>
<tr>
<td></td>
<td>SD=19.80</td>
<td>SD=13.18</td>
<td>SD=24.66</td>
</tr>
</tbody>
</table>

The numbers reveal that throughout the green market chain, the gross margins are positive. The production level has the highest gross margin with an average of 71%, followed by the retail with 41% and the wholesale level has the lowest gross margin with 21%. The considerably higher gross margin at the producer level compared to the other stages is remarkable at first sight. However, the producer’s high gross margin is to be put in perspective, the own labour cost of the actors, i.e. the non-hired (family) labour is not calculated in with the respective opportunity costs. These own labour cost per unit of produce are the largest for the producers, followed by the retailers and are the lowest for the wholesalers.

The comparative survey reveals a gender differentiation along the value chain. Based on the surveys the production and the wholesale is largely conducted by men (83% and 63%), while retailing is predominantly a female domain (72%). The retailers are also the actor group that has the largest share of additional sources of income with 84% having alternative sources of income (compared to 23% for the retailers and 28% of the producers). The persistence of actors as expressed by the years of experience of the actors in the chain does not reveal substantial differences. While the retailers and wholesalers have lower mean years of experience (6.6 and 5.9) than the producers (9.0) the standard deviations reveal considerable variance in all stages.

The wholesalers are more specialised on products as they typically only trade one type of vegetables (M=1.25;SD=0.543) and the retailers do business with more than two vegetables (M=2.66; SD=1.648).
Since the gross margin indicated above are given in relative numbers they only represent the distribution of the gross margin within the green market chain inadequately. Thus, the margins were calculated in relation to the final product price (retail) for each step. The numbers represent the gross margin in relation of the final product price and are presented in the graph below.

### Figure 14: Distribution of gross margin in the green market chain

Roughly half of the total gross margin is thus allocated to the retailers, about 16% goes to the wholesalers, and about a third of the total gross margin is allocated to the producers. It is to be emphasised that these figures are relative numbers and do not directly indicate the profit for the individual actor. Rather the profit for the individual actor – producer, wholesaler or retailer – is given by the product of the volume traded and the respective gross margin figure. As the volumes traded per actor are the largest at the wholesalers by an order of magnitude, it is to be expected that wholesaling provides the largest profit opportunity for an individual actor in the value chain.

#### 4.2. Gross margin analysis of producers

Within the producer survey, the cost and the potential revenue of at least one particular vegetable crop currently in cultivation were interrogated. Based on this data, the gross margin was calculated for each producer. Table 6 below reports the obtained gross margins according to their value chain integration. A producer was considered to participate in a value chain if he or she sold produce through this value chain within the past 24 months.

<table>
<thead>
<tr>
<th>Value chain type</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>One-way ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green markets</td>
<td>71.68</td>
<td>23.47</td>
<td>F=0.265 (p=.608)</td>
</tr>
<tr>
<td>Seed production</td>
<td>66.36</td>
<td>12.04</td>
<td>F=1.316 (p=.253)</td>
</tr>
<tr>
<td>Processed vegetables</td>
<td>77.35</td>
<td>23.24</td>
<td>F=2.890 (p=.592)</td>
</tr>
<tr>
<td>Tourism and institutional buyers</td>
<td>80.25</td>
<td>16.92</td>
<td>F=4.180* (p=.043)</td>
</tr>
</tbody>
</table>
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

<table>
<thead>
<tr>
<th>Value Chain</th>
<th>Mean Margin</th>
<th>SD</th>
<th>F-Value</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh vegetables export</td>
<td>80.94</td>
<td>14.23</td>
<td>F=4.878*</td>
<td>p=0.029</td>
</tr>
<tr>
<td>Overall</td>
<td>72.31</td>
<td>21.28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overall the gross margin was at 72.31% (sd=21.28). The value chain with the lowest mean gross margin is the seed production, followed by the green market. The processed vegetables, institutional buyers and tourism, and fresh vegetable export achieved above average mean gross margins.

See how the gross margins compares between participating and non-participating producers a one-way ANOVA was conducted. Thereby, for two value chains the means were significantly different between participating and non-participating producers, namely those integrated into tourism and institutional buyers (F=4.180, p=0.043) and fresh vegetable exports (F=4.878, p=0.029). In both cases the mean gross margin of the farmers participating in the respective chains were higher than the non-participating farmers.

*Predicting the gross margin by means of multivariate regression models*

In order to assess the factors influencing the profitability of the producers a regression analysis with two distinct sets of models was conducted. Thereby the gross margin of the individual producers is used as a proxy for profitability in all models. Since the underlying hypothesis of the analysis was that the value chain type in which the producer is integrated influences profitability, the variables for the value chain integration were included in one model of each set.

The variables used in both regression models are summarised in the Table 7 below.

**Table 7: Variables used for the regression models predicting the gross margin**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Scale/Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community engagement</td>
<td>Number of community engagements in the past 12 months</td>
<td>numeric</td>
</tr>
<tr>
<td>Education</td>
<td>Average years of schooling of the adults per household</td>
<td>numeric</td>
</tr>
<tr>
<td>Experience in vegetable cultivation</td>
<td>Experience in vegetable cultivation in years</td>
<td>numeric</td>
</tr>
<tr>
<td>Farm size</td>
<td>Total farm size in acres</td>
<td>numeric</td>
</tr>
<tr>
<td>Natural capital index</td>
<td>Index created from farm size, availability of irrigation, and centrality</td>
<td>numeric</td>
</tr>
<tr>
<td>Financial capital index</td>
<td>Index created from household item index, Ability to pre finance agricultural inputs, and market integration</td>
<td>numeric</td>
</tr>
<tr>
<td>Fresh vegetable export participation</td>
<td>Whether a producer participates in the fresh vegetable export</td>
<td>binary (0=non-participation; 1= participation)</td>
</tr>
<tr>
<td>Green market participation</td>
<td>Whether a producer participates in the green markets</td>
<td>binary (0=non-participation; 1= participation)</td>
</tr>
<tr>
<td>Human capital index</td>
<td>Index created from household education level, farmer education level</td>
<td>numeric</td>
</tr>
</tbody>
</table>
In the first models it was assumed that the asset endowment of the producers influences the gross margin more accurately than the individual variables. Therefore an index for each capital type was constructed (see p.69).

**Regression models with extracted components and VC-types**

In order to assess the influence of the individual capital endowment on the gross margins two regression models have been constructed. The first model assumes that the gross margin is explained by the capital endowment, and the second model assumes that the capital endowment and the value chain integration explain the gross margin. Table 8 below summarises the results of the regression analysis.

**Table 8: Regression model predicting gross margin by capital endowment and value chain integration**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1 (Capital endowment)</th>
<th>Model 2 Capital endowment and VC integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>B</td>
<td>SE B</td>
</tr>
<tr>
<td>Constant</td>
<td>72.31</td>
<td>1.81</td>
</tr>
<tr>
<td>Natural capital index</td>
<td>0.02</td>
<td>2.06</td>
</tr>
<tr>
<td>Financial capital index</td>
<td>-0.88</td>
<td>2.16</td>
</tr>
<tr>
<td>Human capital index</td>
<td>-1.05</td>
<td>1.92</td>
</tr>
</tbody>
</table>
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
</tr>
<tr>
<td>Constant</td>
<td>76.39</td>
<td>11.31</td>
</tr>
<tr>
<td>Travel time to input procurement market</td>
<td>-0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>Experience of vegetable cultivation in years</td>
<td>0.32</td>
<td>0.21</td>
</tr>
<tr>
<td>Number of community engagements in the</td>
<td>-0.13</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Model 1 reveals that capital endowment itself does not explain a significant portion of the variance in the gross margin ($R^2=0.017$, $F(9,124)=0.56$, $p=0.685$). All predictors have low coefficients and none of the capital types predicts gross margin significantly, the coefficients for the financial, human and social capital is marginally negative, the natural capital neutral.

Model 2 suggests that capital endowment combined with the value chain type participation can be used for predicting the gross margin. Indeed, the model 2 does explain a significant portion of the variance in the gross margin ($R^2=0.139$, $F(5,119)=0.56$, $p=0.685$). The variables predicting gross margin significantly are the participation in the institutional buyers and tourism value chain ($b=0.32$, $t(9,131)=3.15$, $p=0.002$) and participation in the fresh vegetable export value chain ($b=0.46$, $t(9,131)=3.15$, $p=0.002$).

Overall both models incorporating capital endowment only predict the gross margin unsatisfactorily. Thus, we decided to construct two alternative models without the use of the capital indices. Instead, the two models are based on a set of individual variables combined with the variables already used above for the value chain integration. The assumption behind is that a set of individual variables does predict gross margin more robustly than the capital indices. Table 9 below summarises the two models.

Table 9: Regression models predicting gross margin with individual independent variables and VC-types
### Vegetable value chain in northern Tanzania

<table>
<thead>
<tr>
<th>Past 12 months</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.03</td>
<td>0.04</td>
<td>-0.06</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Total farm size in acres</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only source of income</td>
<td>7.41</td>
<td>7.40</td>
<td>0.16</td>
<td>7.22</td>
<td>4.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average years of schooling</strong></td>
<td>-0.63</td>
<td>0.88</td>
<td>-0.07</td>
<td>-1.00</td>
<td>0.86</td>
</tr>
<tr>
<td><strong>(adults per household)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of subsistence production</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.02</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received support by</td>
<td>3.45</td>
<td>4.42</td>
<td>0.07</td>
<td>4.69</td>
<td>4.29</td>
</tr>
<tr>
<td><strong>external facilitator</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>-6.08</td>
<td>5.11</td>
<td>-1.11</td>
<td>-6.29</td>
<td>4.98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green market participation</td>
<td>12.56</td>
<td>7.56</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed production participation</td>
<td>3.91</td>
<td>10.32</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processed vegetables participation</td>
<td>1.85</td>
<td>13.01</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional buyers and tourism participation</td>
<td>14.33</td>
<td>6.17</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh vegetable export</td>
<td>24.50</td>
<td>8.31</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.09</td>
<td>0.211</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F for change in R²</td>
<td>1.41</td>
<td>3.55</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Again, the model 3 fails to predict the gross margin significantly better than the mean (R²=0.017, F(9,128)=1.41, p=0.187). The only variable that predicts the gross margin significantly is the number of community activities in the past 12 months (b=-0.18, p=0.042). This means that the higher the number of community activities a producer is engaged the lower is his or her gross margin.

The model 4 predicts the gross margin significantly better (R²=0.211, F(14,128)=3.55, p=0.005) than the mean and explains 21% of the variance in the gross margin. The models entails three variables predicting the gross margin significantly, namely the participation in the fresh vegetable export value chain (b=0.44, p=0.003), the participation in the institutional buyers and tourism (b=0.26, p=0.022), and the number of community engagement (b=-0.23, p=0.01). Other variables having relatively large coefficients but are not predicting gross margin better than their mean are the only source of income (b=0.16, p=0.978) and participation in the green market (b=0.28, p=0.099).
4.3. Smallholder participation and asset endowment

*Endowment of assets according to the VC-type integration*

To see how the producers are endowed with assets, an index was created for each asset type according to the sustainable livelihoods approach, namely the social capital, human capital, economic capital, and natural capital by means of PCA. The variables used to construct the indices are listed in Table 10.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
<th>Scale / Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natural capital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm size</td>
<td>The size of the farm in acres</td>
<td>numeric</td>
</tr>
<tr>
<td>Availability of irrigation</td>
<td>Irrigation is available throughout the year</td>
<td>binary (irrigation available / irrigation not available)</td>
</tr>
<tr>
<td>Centrality</td>
<td>Travel time in minutes to the next place to procure agricultural input supply</td>
<td>numeric</td>
</tr>
<tr>
<td><strong>Economic capital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household item index</td>
<td>Index of items a household possesses</td>
<td>numeric</td>
</tr>
<tr>
<td>Ability to pre-finance inputs</td>
<td>The ability to pay upfront for the agricultural inputs from own means</td>
<td>binary (pre-financing from own means possible / not possible)</td>
</tr>
<tr>
<td>Market integration</td>
<td>The land share allocated for cash crops related to the whole farm size</td>
<td>numeric</td>
</tr>
<tr>
<td><strong>Human capital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household education level</td>
<td>Average years of schooling of adult members of the household</td>
<td>numeric</td>
</tr>
<tr>
<td>Respondent education level</td>
<td>Education level of respondent (typically household head)</td>
<td>ordinal (no formal schooling, primary school, secondary school, tertiary school)</td>
</tr>
<tr>
<td><strong>Social capital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participation in community activities</td>
<td>Number of community engagements within the past 12 months</td>
<td>numeric</td>
</tr>
<tr>
<td>Borrowing capacity</td>
<td>The ability to raise a small loan of TZS 30'000 within its social network</td>
<td>Ordinal (5-item likert scale)</td>
</tr>
</tbody>
</table>

For each of capital types (natural, economic, human, and social) and index was created by conducting a principal component analysis. In order to make the indices comparable, the factor loadings from the principal component analysis were standardised. Subsequently, the correlation of each index with the respective value chain type was calculated. Table 11 summarises the results by displaying the mean index scores and the correlation with the respective value chain.

<table>
<thead>
<tr>
<th>Table 11: Mean scores of the capital indices according to VC integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural</td>
</tr>
</tbody>
</table>

69
Overall there is a significant positive correlation between the sum of the individual capital types and the degree of value chain integration ($r_s=0.261$, $p=0.002$). This overall correlation is mainly given by the high negative relation between participation in green markets and capital endowment ($r_s=-0.501$, $p=0.000$) and the negative relation between capital endowment and participation in the fresh vegetable exports ($r_s=0.261$, $p=0.002$).

The correlations between the individual capital indices and the value chain integration reveal that only four combinations of capital forms and value chain integration have a significant correlation. Namely, the participants in the green market value chain have a significantly lower capital endowment ($r_s=-0.233$, $p=0.006$); there is a significant positive correlation between the seed producers and the amount of economic capital ($r_s=0.207$, $p=0.013$), and furthermore there is a significant positive correlation between participation in the fresh vegetable export chain and the endowment with natural capital ($r_s=0.313$, $p=0.000$) and with social capital ($r_s=0.184$, $p=0.028$).

Due to the fact that the indices have been normalised the mean values across the whole sample are zero. In order to assess whether there is a relation between capital forms and the highest participating value chain, the correlation has also been calculated. The correlations are all positive ($r_s$ between 0.353 and 0.145) meaning that producers’ integration in a higher value chain types have higher scores on the capital indices. However, only the relationship between natural capital ($r_s=0.353$, $p=0.000$) and economic capital ($r_s=0.173$, $p=0.039$) are significant.

We conclude that all capital types do to some degree correlate positively with the value chain type integration, but only for the natural capital and the economic capital a significant correlation could be established. From these statistical correlations it cannot be determined whether the positive relationship is a result of the value chain integration or the value chain type requires a particular set of assets.

Figure 15 below gives an overview on the endowment with capital types according to the value chain integration.
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

Figure 15: Capital endowment according to value chain type integration

It is to be noted that the capital per value chain are represented based on the mean values thus distributional effects are only comprehended inadequately. The indices scores are based on the normalised factor score and thus a positive value means that the mean endowment with a type of capital is above the average, while a negative value corresponds with a lower endowment with capital than the average.

The participants in the green market value chain are for all capital types consistently low. Seed producers have an above average configuration with economic capital, while all other capital types are below the average. Producers in the processed vegetables value chain have an above average endowment with economic and human capital while their social capital as well as the natural capital is below the average. Farmers engaged in the institutional buyers and tourism value chain have higher capital configuration in economic, natural and social capital, while their human capital is below average. Lastly, the capital endowments of the producers engaged in the fresh vegetable exports are consistently above the average.

To compare overall capital endowments across the value chain types Figure 16 below presents the capital profiles per value chain in a radar graph.
The presentation indicates two main conclusions. First, the producers engaged in the green value chain have with the lowest capital endowment; in particular they feature the lowest economic and natural capital. The producers integrated into the fresh export value chain on the other hand are the producers with the richest capital endowment. The other value chain types are in between the aforementioned two cases. The configuration with assets is rather symmetrical between the four capital types for the value chains green markets, institutional buyers and tourism, and fresh vegetable exports. The configuration of the seed producers and the farmers involved in vegetable processing are inclined toward the economic capital and constraint on the social capital side.

**Farm size**

The size of the arable land a produce has at its disposal is the key indicator to decide whether a farm is considered a smallholder farm or not. To check the hypothesis whether the smallholder participation differs in different value chains, the farm sizes were compared. Table 12 presents the mean farm sizes according to the value chain integration.

**Table 12: Farm sizes in acres according to the value chain integration**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Correlation (Spearmans rho)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green markets</td>
<td>3.34</td>
<td>3.54</td>
<td>-0.165 (p=0.051)</td>
</tr>
<tr>
<td>Seed production</td>
<td>4.69</td>
<td>3.64</td>
<td>0.129 (p=0.127)</td>
</tr>
<tr>
<td>Processed vegetables</td>
<td>2.33</td>
<td>1.15</td>
<td>-0.033 (p=0.698)</td>
</tr>
<tr>
<td>Tourism and institutional buyers</td>
<td>4.07</td>
<td>2.87</td>
<td>0.139 (p=0.102)</td>
</tr>
<tr>
<td>Fresh vegetables export</td>
<td>6.03</td>
<td>10.18</td>
<td>0.071 (p=0.402)</td>
</tr>
<tr>
<td>Overall</td>
<td>3.85</td>
<td>5.19</td>
<td>0.203*</td>
</tr>
</tbody>
</table>
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

The correlations were calculated with the highest value chain type a producer is involved.

The analysis indicates that there is no significant correlation between the farm sizes and the individual type of value chain integration. The overall mean farm size was 3.85 acres, however with a considerable variation (SD=5.19). The producer involved in exporting fresh vegetables had the largest mean farm size but with a high standard deviation (SD=10.18). The correlation coefficients for farm size and value chain integration are negative for the value chains green markets ($r_s=-0.165, p=0.051$) and processed vegetables ($r_s=-0.033, p=0.698$) and positive for seed production ($r_s=0.129, p=0.127$), tourism and institutional buyers ($r_s=0.139, p=0.102$), and fresh vegetables export ($r_s=0.071, p=0.402$). The only correlation that was significant is the relationship between the farm size and the highest value chain type a producer is integrated ($r_s=0.203, p=0.016$). Given the low coefficients and non-significance of the individual value chain types and the high variation in the fresh vegetable exports it is not reasonable to conclude that there is a correlation between farm size and type of value chain integration.

**Cluster analysis of demographic sample**

The analysis of the gross margin, the farm sizes and the asset endowment only revealed limited systematic differences between the producers. This is contrasting with the field observations and thus it was discussed to conduct a cluster analysis for classifying the producer profiles into distinctive groups. Thereby the variables indicating the participation in particular value chains and a number of additional variables were included. The analysis provides a two-cluster solution, which does allow for meaningful interpretation of the clusters. Table 13 below summarises the resulting clusters and their characteristics. The variables are sorted according to their predictor importance.

<table>
<thead>
<tr>
<th>Table 13: Clustering of producers</th>
<th>Cluster 1: Participators in green market VC</th>
<th>Cluster 2: Participators in complex VC types</th>
<th>Independent t-test (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green markets participation</td>
<td>86 / 86 (100%)</td>
<td>11 / 54 (20.37%)</td>
<td></td>
</tr>
<tr>
<td>Fresh vegetables export participa-</td>
<td>0 / 86 (0%)</td>
<td>24 / 54 (44.44%)</td>
<td></td>
</tr>
<tr>
<td>tion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed production participation</td>
<td>0 / 86 (0%)</td>
<td>13 / 54 (24.07%)</td>
<td></td>
</tr>
<tr>
<td>Tourism &amp; institutional buyers</td>
<td>7 / 86 (8.14%)</td>
<td>17 / 54 (31%)</td>
<td></td>
</tr>
<tr>
<td>participation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm size</td>
<td>$M=2.99$ acres SD=3.21 acres</td>
<td>$M=5.22$ acres SD=7.15 acres</td>
<td>-2.526** (p=0.013)</td>
</tr>
<tr>
<td>Processed vegetables participation</td>
<td>2 / 86 (2.33%)</td>
<td>7 / 54 (12.92%)</td>
<td></td>
</tr>
<tr>
<td>Age level</td>
<td>Median=3 (31-40 years)</td>
<td>Median=3 (31-40 years)</td>
<td></td>
</tr>
<tr>
<td>Subsistence share</td>
<td>$M=57.11$</td>
<td>$M=39.84$</td>
<td>2.072**</td>
</tr>
</tbody>
</table>
Cluster 1 is characterised by its full integration into the green market value chain. Participation in other value chain types non-existent (Fresh vegetables export, seed production) or sparse (8.14% for Tourism and institutional buyers and 2.33% for processed vegetables). The mean farm size is at 2.99 acres and the mean of the land allocated for subsistence production is 57.11%. The producers of this cluster score at 7.88 on the household item’s index, the household size is at 4.04 persons, and the producers have an average of 10.21 years of experience in vegetable cultivation. Roughly 15% of the producers are female. Based on these characteristics, the members of the cluster 1 are interpreted as the principal participants of the green markets.

The cluster 2’s predominant feature is its high participation in value chains other than the default green market. While 20.37% of the producers in cluster 2 are also engaged in the green market, they account for the vast majority of the participation in the more sophisticated value chain types. 44.44% are engaged in the fresh vegetables export, 24.07% in the seed production, 31% in the tourism and institutional buyers, and 12.92% in the processed value chain. The producers of the cluster 2 account for 90.09% percent of the non-green-market value chain participation. The farm sizes of the producers average at 5.22 acres with is significantly higher the ones of cluster 1 (two-sample $t(138)=-2.526, p=.013$). The age level of 3.78 is slightly but not significantly (two-sample $t(138)=-1.464; p=.146$) higher than in the cluster 1. Producers of cluster 1 do allocate less of their land for subsistence (two-sample $t(138)=2.072, p=.040$). With regard to material wealth, the producers of cluster one have a higher score on the household item’s index with a mean score of 6.63 although the difference is not significant (two-sample $t(138)=-1.467; p=.145$). The household size of cluster two is not significantly higher than the household size of cluster 1’s producers (two-sample $t(138)=-1.066, p=.288$). Producers of the cluster one have slightly but not significantly higher education level (two-sample $t(138)=-0.571, p=.569$). Finally the cluster 2’s producer are only slightly but not significantly more experience in cultivating vegetables (two-sample $t(138)=-0.594, p=.554$).

Due to these characteristics of the cluster 2 we conclude that the cluster 2 represents the producers participating in other, more demanding the value chain than the green market.

Before concluding the results on the smallholder participation it is to be noted that the integration into the chain depends on the institutional and organisational arrangement of the respective value chain type. Thereby it is important to take into account that supplying to multiple value chains is a common practise. In our sample, which was stratified according to value chain types, 45% of the producers
engaged in value chains other than green markets are also using the green market as a fall-back option. From the interviews conducted with the demand side, the buyers stated a clear preference for producers with the ability to deliver large quantities of produce, which requires having access to large farmland. However, due to the lack of such large-scale producers, the buyers have to enter into relations with producers only being able to supply limited quantities as well. There was not a single case where the buyer reported to collaborate with smallholders on a first preference basis.

4.4. Collective organisation of producers

For a first assessment of the collective activities jointly undertaken by the producers, they were asked whether they have regularly participated in some formal type of community activities that are directly associated with their vegetable farming within the past 12 months. These activities are directly related to their farming activities and include for example active participation in farmer organisations, maintenance of irrigation infrastructure, or maintenance of feeder roads. Both, informal activities (e.g. informal helping out neighbouring farmers) and activities not related to vegetable production (e.g. community or church activities) were not included. Table 14 below presents the participation of the producers according to the value chain they are participating in.

Table 14: Participation in agricultural-related community activities per value chain type

<table>
<thead>
<tr>
<th>Value Chain</th>
<th>n</th>
<th>Regular participation in community activities</th>
<th>No regular participation in community activities</th>
<th>Share of participants in percent</th>
<th>Correlations (Spearmans’s rho)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green market</td>
<td>97</td>
<td>52</td>
<td>45</td>
<td>53.61%</td>
<td>-0.187* (p=0.026)</td>
</tr>
<tr>
<td>Seed production</td>
<td>15</td>
<td>12</td>
<td>3</td>
<td>80.00%</td>
<td>0.141 (p=0.94)</td>
</tr>
<tr>
<td>Processed vegetables</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>58.33%</td>
<td>0.156 (p=0.63)</td>
</tr>
<tr>
<td>Tourism &amp; institutional buyers</td>
<td>23</td>
<td>10</td>
<td>13</td>
<td>43.40%</td>
<td>-0.147 (p=0.81)</td>
</tr>
<tr>
<td>Fresh vegetables export</td>
<td>24</td>
<td>21</td>
<td>3</td>
<td>87.50%</td>
<td>0.254* (p=0.02)</td>
</tr>
<tr>
<td>Total (Correlation with highest VC participating)</td>
<td>142</td>
<td>85</td>
<td>47</td>
<td>59.8%</td>
<td>0.192* (p=0.022)</td>
</tr>
</tbody>
</table>

Overall about 60% of the producers do participate in some sort of formal community activities that are directly related to their vegetable production. The participation shares among the value chain types differ considerably. Producers engaged in the green market value chain have a significant lower participation share of 53.61% ($r_s=-0.187$, $p=0.026$). The lowest collective community activity rate have the producers involved in the tourism and institutional buyers value chain with a share of 43.80% ($r_s=-0.147$, $p=0.081$). The farmers engaged in the seed production and in the processed vegetables value chain have participation shares above the average (80% and 58.33%) but they do not significantly correlated. The value chain with the highest participation share (87.50%) is the fresh vegetables export,
which significantly correlates with the agricultural-related community activities ($r_s=0.254$, $p=0.02$).

Overall the correlation between the participation in community activities and the most sophisticated value chain type (according to the typology developed in part 1) was significantly positive ($r_s=0.192$, $p=0.022$). Thus, we conclude a positive relationship between the complexity of a value chain and the producers’ collective activities.

More specifically, the participation in producers’ associations was assessed by checking whether the respondents or the members of their household were active members of a producer association. Table 15 summarises the participation rates in producer associations according to the value chain types.

### Table 15: Membership in producer associations per value chain type

<table>
<thead>
<tr>
<th>Value Chain Type</th>
<th>n</th>
<th>Member</th>
<th>Non-member</th>
<th>Member share in percent</th>
<th>Correlations (Spearman’s rho)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green market</td>
<td>97</td>
<td>28</td>
<td>69</td>
<td>28.87%</td>
<td>$-0.153$ $(p=0.069)$</td>
</tr>
<tr>
<td>Seed production</td>
<td>15</td>
<td>1</td>
<td>14</td>
<td>6.67%</td>
<td>$-0.197^*$ $(p=0.019)$</td>
</tr>
<tr>
<td>Processed vegetables</td>
<td>12</td>
<td>2</td>
<td>10</td>
<td>16.67%</td>
<td>$-0.137$ $(p=0.105)$</td>
</tr>
<tr>
<td>Tourism &amp; institutional buyers</td>
<td>23</td>
<td>7</td>
<td>16</td>
<td>30.43%</td>
<td>$-0.0313$ $(p=0.712)$</td>
</tr>
<tr>
<td>Fresh vegetables export</td>
<td>24</td>
<td>15</td>
<td>9</td>
<td>62.5%</td>
<td>$0.274^{**}$ $(p=0.001)$</td>
</tr>
<tr>
<td>Overall (correlation with highest VC-type)</td>
<td>142</td>
<td>48</td>
<td>94</td>
<td>33.80%</td>
<td>$0.151$ $(p=0.074)$</td>
</tr>
</tbody>
</table>

Overall, the degree of organisation in producer associations is at 33.8%. The producers supplying fresh vegetables for export are the only value chain that is above the average. The green market has an average member share of 28.9%, seed production has 6.7%, processed vegetables have 16.7% and tourism and institutional buyers has 30.43%. It is important to keep in mind that many producers are integrated into more than one value chains and thus producers can be involve in multiple value chain types. The difference between the number of the (non) membership of the individual value chain types and the overall is to be explained by this fact.

The correlation coefficients between the value chain type and the membership in producer organisation indicate only for the fresh vegetable export value chain a positive correlation and in addition a highly significant one ($r_s=0.274$, $n=142$, $p=0.001$). All other value chain types are negatively correlated with membership in producer associations, however the only significant negative correlation was the seed production value chain type ($r_s=-0.197$, $n=142$, $p=0.019$).

The producer survey investigated on the motivations for joining or refraining to join a producer organisation. The questions were specified as open questions and thus no pre-defined possibilities were given to the respondents. The answers were transcribed and coded into as set of categories. The table below summarises the categories and the frequency they were stated in the sample.
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

Table 16: Self-reported reasons for joining a producer organisation

<table>
<thead>
<tr>
<th>Reasons provided for joining a producer organisation</th>
<th>Number of occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>General learning and sharing of experience</td>
<td>73</td>
</tr>
<tr>
<td>Better marketing of produce</td>
<td>66</td>
</tr>
<tr>
<td>Learn production techniques</td>
<td>50</td>
</tr>
<tr>
<td>Availability of obtaining loans</td>
<td>36</td>
</tr>
<tr>
<td>Getting access to aid from donors</td>
<td>26</td>
</tr>
<tr>
<td>Procurement of inputs jointly</td>
<td>23</td>
</tr>
<tr>
<td>Increased bargaining power</td>
<td>19</td>
</tr>
<tr>
<td>Increased market information</td>
<td>18</td>
</tr>
<tr>
<td>Collaboration with other producers is motivating</td>
<td>13</td>
</tr>
<tr>
<td>Collectively cultivation of land</td>
<td>8</td>
</tr>
<tr>
<td>Social pressure to join</td>
<td>1</td>
</tr>
<tr>
<td>Security</td>
<td>1</td>
</tr>
</tbody>
</table>

The main reason provided for joining a producer group was the possibility to easily obtain information about the cultivation and marketing of vegetables as well as to share experiences of and from peers. This was followed by the opportunity to better market the produce through the producer organisation. Somewhat lower rated was the possibility to learn and improve vegetable production techniques. As some producer organisations are operating a credit-saving-scheme (SACCOs) the ability to obtain a loan was mentioned as a prominent motivation to join a producer group. Furthermore, a producer group is seen a means to access support and aid from donors. The joint procurement of agricultural inputs by the producer group was rated favourably. 19 respondent concluded that their bargaining power mainly for marketing the produce, but also for procuring inputs increased by being part of producer group. Also stated was that by the joint organisation facilitates their information on the vegetable markets. 13 respondents stated that collaboration with other vegetable producers is motivating for themselves.

Table 17: Self-reported reasons for not joining a producer organisation

<table>
<thead>
<tr>
<th>Reasons provided for not joining a producer organisation</th>
<th>Number of occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependency on other’s activities, performance, or behaviour</td>
<td>62</td>
</tr>
<tr>
<td>Too much coordination for little tangible results</td>
<td>45</td>
</tr>
<tr>
<td>Distrust in the management of the organisation</td>
<td>33</td>
</tr>
<tr>
<td>No time for additional (coordination) activities</td>
<td>23</td>
</tr>
<tr>
<td>Cost associated with participating are high (time and fees)</td>
<td>17</td>
</tr>
<tr>
<td>Constraining the individual degree of freedom</td>
<td>7</td>
</tr>
<tr>
<td>Not aware of any group</td>
<td>2</td>
</tr>
<tr>
<td>Long delays of the obtaining cash from coop’s sales</td>
<td>2</td>
</tr>
<tr>
<td>It’s for old people</td>
<td>1</td>
</tr>
</tbody>
</table>
Apparentlly being member of a producer organisation has its disadvantages as well. The stated arguments may be summarised into three main domains:

Opportunism:
The most frequently mentioned argument was that farmers participating in producer organisations depending on the behaviour of the fellow producers. This refers to decisions taken at the producer organisations management and the performance of individual farmers influencing the reputation of the group. The argument is closely associated with the disadvantage that being a member of producer organisation confines the individual degree of freedom, which was also mentioned.

Lack of trust in the producer organisation:
Secondly, there seems to be a lack of trust in the organisation itself as well as in its performance. Closely related, producer organisations’ management are conceived intransparent and subject to mismanagement resulting in low trust in the organisation’s management. Along the same line is the stated disadvantage that the producer organisation has (too) long delays between the time of obtaining the revenue until it is forwarded to its members.

Lack of efficiency:
Thus, the disadvantage mentioned secondly is that participating in a producer organisation is not efficient as the time invested in (coordination) group activities does not outweigh the benefits as the potential benefits are conceived little tangible. The respondents expressed doubt whether it is worthwhile joining a producer organisation by mentioning, that they did not have the time to invest in additional activities required for participation a producer organisation and that the cost associated with a producer organisation in terms of membership fees and required time to attend activities are too high.

5. Interpretation

In the following each research question is addressed individually.

Research questions on smallholder participation

*Of what nature is the smallholder participation in vegetable value chains, and which is the asset base of vegetable producers?*

While the term “smallholder” is often used in the context of Sub-Saharan African agriculture it is less clear how it can be defined in a meaningful way. Certainly, the size of the landholding a farmer has access to is a key criterion for defining the term smallholder. But the "smallness" (Chamberlin 2008) in smallholder farming does refer to other dimensions than just size and is highly context-specific. Namely, the level of assets, vulnerability to risks or the degree of probability of loss of wealth or welfare, the degree of market integration or subsistence level, constraints in access to credit, technology and market information are complementary dimensions of smallholder farming.

In our case of vegetable farming, only producers, which are actually integrated into value chains, have been studied. The degree of subsistence – the ratio of land allocated to subsistence production to the
Findings part 2: Profitability, smallholder involvement and producer’s collective action in the value chains

total available land – ranges from 0% to 95% (m=38.44, sd=27.31). In our analysis a significant correlation between a single value chain type and the land holding size could not be established. However, a significant relationship between land size and the rank on the highest value chain the producer is integrated was established ($r_s=0.203, p=0.016$). This means that the producers involved in more sophisticated value chains tend to have access to larger areas of agricultural land. While this correlation was significant, its size is somewhat modest which is the result of larger variations of the landholding within each value chain. In all value chain types producers with less than one acre were observed. Thus, despite the general positive correlation between the farm size and degree of involvement in sophisticated value chains, size by itself is not the decisive factor for integration in a particular value chain type.

The endowment with assets of the vegetable producers was studied by analysing different forms capital forms, namely natural, financial, human and social capital. It was shown, that producers engaged in more complex value chain types have a relatively higher asset base across all capital types. As farm size is one of the variables used for calculating the natural capital index score, the total farm size is significantly correlated with natural capital ($r_s=0.605, p=<0.001$). The financial capital endowment is the only other capital form, which is significantly correlated with the farm size ($r_s=0.345, p=<0.001$). The only significant correlation between capital types and the degree of subsistence farming is financial capital, where the cash-crop share is used as one of the index’s components.

The modalities of the participation in the green market value chain are to a large degree independent of the scale of the producer. Selling of the vegetables for the green market is in most cases done at the farm-gate between the individual producer and the intermediary. Even producers with a very limited production quantity are acting atomistically and no systematic collective marketing was observed for the green market. Thus, if a producer participates in the green market value chain it is his own responsibility to market his produce and this situation carries a considerable business risk for the producer.

In terms of the nature of smallholder participation, the farmers engaged in the seed production and the processed vegetables value chains have a very similar arrangement. Both actor types, the processor as well as the seed producer, revealed a strong preference for producers with relatively large production capacity. The reason provided is that entering relations with a large amount of individual actors is time-consuming and considered little efficient. Smallholders participating in this chain do have to collectively organise their relations with the buyer. If there are written contractual arrangements they are always between the buyer (processor, seed producer) and a collective organisation of smallholders, the producers are not contracted individually but as group. Typically, this collective organisation does only include marketing of the produce (and pre-processing of the vegetables in the case of seed production). The contractual arrangement between the parties provides the smallholder with a business opportunity with relatively low risk, as the marketing of the produce is guaranteed and the prices are fixed in advance of the production.

Integration of the producers participating in the institutional buyers and tourism value chain is shaped by the particular requirement of this chain. The quality requirements are high and producers need the capacity to cope with changing demand of the types of vegetables demanded. The quantities are typically relatively low. This results in tight coordination between the producer and the buyer. The organisational arrangements observed which include smallholder observed are two-fold. Either the produc-

---

1 The correlation coefficients and the significance levels remained similar when a smallholder index was calculated with the variables farm size and subsistence share by means of a principal component analysis.
ers are organised in a collective organisation, which is responsible for the contractual relations with the buyer. The organisation is not only responsible for selling the produce but it also has to coordinate the production planning of its member in order to cope with its customer’s requirements. The flexibility required is a challenge for the collective organisation and calls for with strong management capabilities of the organisations’ members or staff. Alternative to the collective marketing, producers not engage in a farmer group are also individually marketing their produce to institutional buyers and hotel and restaurants. Thereby the producer and the buyer are in frequent and informal contact in order to balance demand and supply. The contractual arrangement is informal and is based to a large degree on the trust of the parties involved. Producers marketing individually emphasised the importance of the green market as a fall-back option for the case where the production quantity is larger than the buyer’s demand. The prices are typically fixed and constant around the time protecting the involved producer from the high fluctuation occurring at the green markets.

Smallholders involved in the fresh vegetable export value chain are exclusively organised in groups. The importers are reluctant in entering contractual arrangements with individual producers below a certain production capacity. In order to ensure both, the required high product quality and the needed production quantity in due time, the exporters typically guide the farmer group tightly and provide various services to the organisations, namely the provision of inputs, agricultural expertise, training on production techniques, and support for the organisation’s management. These substantial investments by the exporter provide the smallholder producers with a comfortable situation as it is in the very interest of the exporter to keep the relations with a group where considerable investments have been allocated. The written contracts between the exporter and the farmer group comprehend a constant price at which the produce is transacted. Combined with the high level of professionalism the fixed prices lead to a relatively low risk for the producer, which is one of the main reasons for smallholders participating in this chain.

Which types of vegetable supply chains do best correspond with a typical smallholder’s asset base?

The relationship between the degree of “smallness” – operationalized with the farm size and subsistence share – and the forms of capital showed that only natural and financial assets are significantly correlated. Smallholders tend to have lower levels of natural and financial capital but no significant relation was found with human and social capital. The analysis of the endowment with capital and their value chain integration has revealed that producers engaged in more sophisticated value chains are endowed with greater total amount of capital. Particularly two value chains correlated significantly; farmers engaged in the fresh vegetable export have the highest level of assets and producers using the green market have the lowest level of assets. In summary, the statistical analysis indicates a positive relation between the producer’s assets and the complexity of the value chain he or she is participating in. However, that statistical relation it is not conducive to assume causality – meaning participa-

---

A recurring area of conflict between the two parties is the quality of the vegetables. The produce is delivered to the exporter and is thoroughly screened for quality. Vegetables not meeting the required quality level is rejected batch-wise to the producer group. Due to complaints by farmer group members, the exporters have moved to the intricate practice of returning the rejects to the individual farmers ensuring full transparency.
tion in more complex value chain results in higher assets – or to assume a precondition – meaning in order to be able to participate in a complex value chain some capital requirements have to be fulfilled\(^3\).

The main question behind the causality hypothesis that participation in more complex value chains leads to an increased asset base is how profitable participation in a particular value chain is. This question is addressed in detail in the next research question (below) but in short it is suggested that more complex value chain generally tend to be more profitable.

The precondition hypothesis assumes that more complex value chain types have higher barriers of entry in terms of capital endowment. This directs our attention towards the requirements for producers that emerge from the operations in a value chain types and how this translates into capital requirement for individual producers. These requirements are summarised per capital type in Table 18 below:

Table 18: Capital requirement for participation in vegetable value chains

<table>
<thead>
<tr>
<th>Capital forms</th>
<th>Requirements for participation in vegetable value chains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural capital</td>
<td>Buyers generally favour producers with larger production capacity. Vegetable cultivation requires access to several production factors: Agro-ecological suitability, access to irrigation, access to transport and proximity to markets.</td>
</tr>
<tr>
<td>Financial capital</td>
<td>Vegetable cultivation requires per se access to financial capital for financing inputs (seeds, fertilisers, pesticides, and other materials).</td>
</tr>
<tr>
<td>Human capital</td>
<td>Vegetable cultivation and marketing is knowledge intensive: Sophisticated production techniques; entrepreneurial skills and spirit are required for profitably marketing the produce.</td>
</tr>
<tr>
<td>Social capital</td>
<td>Organisation in farmer groups is required for participation in some complex value chains. Successfully marketing the products by the individual producer requires a well-maintained social network.</td>
</tr>
</tbody>
</table>

Many requirements are applicable to vegetable cultivation as a whole and are not specific to the type of value chain a producer is participating. Particularly, the agro-ecological suitability, the necessity to pre-finance the costly agricultural inputs, the high demands in terms of knowledge are generic requirements to participation in any vegetable value chain.

The pre-conditions specific to particular value chain types are the following: While local green markets are abundant throughout the countryside, all other value chain types are closely associated with an urban economy. Since vegetables are highly perishable crops, they have to be cultivated within reasonable travel time to a city\(^4\). Even more specific is the locational requirement for the participants in the fresh vegetable exports. Its produce is exported by plane and access to sufficient international cargo capacity is essential. This requirement renders this showcase value chain type only an option to a handful of potential locations on the whole African continent.

\(^3\) In order to check the causality or precondition hypothesis by statistical means, longitudinal data would be needed, a costly and time-consuming task certainly beyond the scope of the present research.

\(^4\) The case of the Usambara Lishe Trust, a cooperative of vegetable farmers producing for institutional buyers and tourism, located in the remote Usambara mountains and delivering to the Dar es Salaam is certainly the exception from the rule. However, their mode of operation in a remote location is substituted by complex and costly transportation logistics.
Access to irrigation is beneficial for the cultivation of most vegetables but particularly in the fresh vegetables export and institutional buyers and tourism value chains irrigation is indispensable. Again, the requirement for access to irrigation has profound geographical implication, as the agricultural land where irrigation is available is highly limited.

Due to the higher product quality requirements the need for skills and knowledge with regard to production techniques and farm and marketing management is clearly higher in complex value chain types. As collective marketing represents the only option for smallholder producers to participate in most of the more complex value chain types, the requirements for social capital are augmented. Overall, we conclude that complex value chain types tend to favour producers with higher capital endowment.

Despite the augmented capital requirements in vegetable value chain, which are to the detriment of smallholder’s asset base, successful smallholder integration is observed in all value chain types observed. We argue that this explained by the following factors: Firstly, the intermediaries do not have an alternative than to cooperate with the existing supplier base. Apparently, the intermediaries have a preference for producers with a large production capacity but the abundance of such producers is limited and thus the intermediaries have to collaborate with smallholders or group of smallholder on a second-best alternative basis. Secondly, the lack of individual smallholder producer to offer a reasonably size production capacity may be compensated by means of collective marketing. However, this does require a well-organised organisation.

**How profitable is participation in various vegetable value chains for smallholders?**

The profitability of the producers was assessed by means of calculating the gross margin of an existing plot where vegetables were cultivated. This implies that the gross margin is used as a proxy for profitability. Using gross margins does not take into account fixed costs and should thus only be used as a comparative measure if the fixed cost structure of the producers are similar and not across sectors (Firth 2002). All surveyed producers are vegetable farmers and have thus comparable fixed cost structures. Although there might be some minor differences they are assumed to be minor. An example would be that higher fixed cost might be associated with increased product quality requirements.

Overall the average gross margin is 72.31% (sd=21.28), which suggests that participation in vegetable value chain is potentially profitable. The gross margin is not only high in absolute terms, but also with regard to the gross margin of other agricultural products in similar contexts: 57.9% for dairy farming in Zambia (Mumba et al. 2011), 66.5% (Ebukiba 2010) for cassava farming in Nigeria, 6.5% for maize production in South Africa (Siyabulela 2005). A similar study on the profitability of vegetable farming in Kenya (Rao & Qaim 2011) revealed gross margins of 79% for the supermarket value chain and 73% for the traditional green markets, which is very much in line with our own results.

The chains where the participating producers have a below average gross margin is the green market chain (m=71.68%, sd=23.47); seed producers have the lowest gross margin (m=66.36, sd=12.04) and processed vegetables (m=77.35, sd=23.24). The two chains that have larger gross margin than the total sample were the tourism and institutional buyers chain (m=80.25, sd=16.92) and the fresh vegetable export chain (m=72.31, sd=21.28).
Analysing the regression models calculated, we conclude that the selected individual explanatory variables combined with the participation in the value chain type predicts the gross margin best. In both combined models participation in the fresh vegetable export and in the institutional buyers and tourism industry are the most reliable predictors. In both hierarchical model-sets, the inclusion of variables pertaining to the value chain integration has rendered overall fit of the model significant. Therefore we conclude that the participation in which value chain a producer participates influences the profitability. The predictors with the largest standardised coefficients are all associated with the value chain integration, namely the integration into the fresh vegetable export, and institutional buyers and tourism (all positive). Thus, we conclude that the type of value chain a producer is integrated is a more important predictor for the gross margin than a set of demographic or asset based indicators.

Both, the regression analysis established that the type value chain a producer participates is the most important predictor for the gross margin. Particularly, the sophisticated value chains fresh vegetables export and the institutional buyers and tourism have shown to be most reliable predictors of the gross margin with relatively high coefficients. Overall, the significant positive correlation between the highest participating value chain and the gross margin ($r_s=0.204$, $p=0.015$) shows the positive relationship between the complexity of the value chain, in which a producer participates and the gross margin.

The gross margin is independent from the farm size in both, the correlation ($r_s=0.097$, $p=0.256$) and in the regression analysis ($b=0.00$, $p=0.978$). Additionally, the share of subsistence production does also not correlate significantly with the gross margin ($r_s=-0.05$, $p=0.555$). Both variables represent prominent indicators for defining smallholder farming and thus we conclude that the gross margin as such is independent of the degree to which a vegetable farmer is considered a smallholder.

**Has participation in vegetable value chains led to increased income and improved livelihood on the household level?**

Increased incomes refer to producers that (i) have started participating in vegetable value chains which previously were not engaged in these value chains, or (ii) that had shifted their participation from vegetable value chain to another. Also the improvement of a producer’s livelihood refers to a change over time that is associated with (i) starting to engage in vegetable value chain, or (ii) a move from one vegetable value chain to another one. However, the methodology applied allowed only to gather data at one point in time and no time series on the incomes and the livelihood situation could be obtained. The ideal methodology for assessing the increase of income would be to obtain longitudinal data, but this was out of the project’s scope and beyond the means available.

Thus, the findings are confined to use the gross margin as proxy for profitability with the limitation outlined above. Assuming that higher gross margins in complex value chains results in higher profits which again turn into an improvement of the livelihoods too cannot be claimed from the data as only gross margin was assessed. However, even if it was the case, the potential for poverty reduction through inclusion would remain a niche since the volumes and thus the potential producer basis remains very limited.
Collective action and entrepreneurship

What are the modes of operation of the vegetable smallholders? How are they embedded in their value chain?

The capacity to produce and deliver relatively large quantities is decisive for the producers’ embeddedness in the vegetable value chain. Medium to large-scale producers are able to produce and deliver relatively large volumes of produce and represent the clear preference of intermediaries and other actors downstream the value chain. In all chains medium and large-scale producers are able to engage directly with intermediaries much easier than individual smallholders with their limited production capacity.

The modes of operation of smallholder vegetable producers highly differ according to their value chain participation. Below it is shown for each value chain type how the smallholders are embedded in the respective value chain and how their mode of operation is.

The governance of the green markets are characterised by their high degree of spot-market arrangements. Additionally, the institutional arrangement of the farm-to-wholesale-market transaction is highly asymmetrical, as a large number of individual smallholding producers are delivering to a very limited amount of wholesalers who have access to the urban wholesale markets. The typical mode of operation of smallholder producers in the green market can be described as atomistic. The smallholders operate highly individually and each one is challenged in marketing its produce. The relations between the intermediaries and the smallholder producers are highly uncoordinated. Occasional collective actions mainly related to production but in isolated cases also in transportation of produce were observed, but any type of collective action or even collective organisation is rather the exception than the norm.

The modes of smallholder operation in the seed production and in the processed vegetable value chain have very similar configurations. Both value chains are characterised by individual channel captains, the seed companies and the processor respectively, that are governing the chain. Due to the lack of large and mid-scale producers, they have entered into relations with smallholder producers. However, the channel captains do not enter into relations with individual smallholder producers but only with if they are collectively organised in a collective organisation. Typically, the relation between collective organisation and the channel captain is guided by a more or less formal contract. The internal organisation of the producer organisation is typically loose; the main activity done collectively is the coordination of the delivery of the product. The individual smallholder producer is fully responsible for the whole production process; the marketing of the produce is done collectively.

In the institutional buyers and tourism value chain, there were two distinct modes of smallholder operations observed. Firstly, innovative smallholders are occupying a market niche by directly supplying exotic vegetables of high quality to tourism actors and supermarket procurement businesses. Thereby the smallholders operate fully individually and the relations between the producer and the buyer are characterised by a relatively high degree of coordination, which is guided of trust. The benefits for the individual producer are a relatively certain market outlet and fixed, high unit prices. This relation is characterised by a lack of horizontal collective action and organisation. Secondly, a large cooperative

---

5 The asymmetry in power relations between individual producers are best exemplified in the case of onion in a very remote location, six hours from the wholesale market, where the wholesalers operate their own brokers to pool the produce.
in the remote Usambara mountains made the case for a highly collectively coordinated mode of operation. The cooperative supplies to premium tourism and catering outlets in Dar es Salaam as well as to the procurement of subsidiary of the largest supermarket chain. The cooperative is coordinating the activities of its members from production planning, to input procurement to bulking, packaging and transporting the produce. There is a tight coordination between the buyers and the cooperative.

The smallholders participating in the fresh vegetable export value chain are throughout collectively organised in farmer groups. Collective organisation is a firm requirement for participation in this value chain. The individual producer is responsible for cultivating and harvesting the produce; the production planning, the input provision, sometimes even the pesticide application, and delivery to the buyer is organised by the farmer group or the buyer itself. The forms of cooperation between the exporter and the producer groups are very close to the degree where the exporter invests into the creation of new groups.

The quantitative analysis of collective actions has shown a modest but significant positive correlation between their engagement in collective action and their value chain integration. Additionally, participation in the fresh vegetable export chain was strongly and significantly positively correlated with membership in a collective organisation.

From these distinct modes of smallholder operations, we draw two conclusions: First, the specific modes of operations are to a large degree context-specific and thus differ even within the value chain type. Secondly, the degree of collective organisation of smallholder increases with the value chain complexity and sophistication. While in basic green markets, there is little collective action and any form of collective organisation is inexistent, collective organisation becomes a necessity for smallholder participation in more complex value chains.

What are the obstacles and the advantages of collective action and collective organisation?

In the following we understand a collective organisation as a specific form of collective action. Undoubtedly, there are other forms of collective action involved in vegetable farming, but due to the focus on value chain integration it was decided to focus on the collective action in the form of a collective organisation of vegetable producers.

As shown above, collective organisation has to be seen as mean to obtain access to more complex value chains. Given the relatively low prevalence rate of collectively organised producers (38%), there have to be strong disadvantages in participating in such an organisation. Our analysis suggests three main reasons, which prevent producers from joining a collective organisation: Opportunism, lack of trust in the organisation, and the lack of efficiency.

There was various form of opportunistic behaviour of members of the collective organisation reported in our research. There was a widespread perception that individual members would not adhere to the rules and required commitments of the organisation. This may transfer into a loss of reputation or directly comprises vital business relations for the collective organisation. Closely associated with the opportunistic behaviour is that by joining a collective organisation, an individual producer looses considerable degree of freedom. As vegetable farming for market production is highly capital-intensive and business-oriented, the individual degree of freedom seems an essential feature for producers.

Generally, producer organisations were perceived as inefficient and the benefits of participation in do not outweigh the disadvantages, understood as the time and financial engagements required.
As a result of the above two disadvantages there is a lack of trust in both the collective organisation’s management as well as in its business performance. Intransparent, arbitrary and slow management decisions were doubted to be suitable in a fast-moving business environment.

On the advantages side participation in a collective organisation were reported to offer clear benefits. These mainly refer to the fact that collective organisations enable the individual producer to have access to various resources. The most prominently stated advantage was the access to knowledge on vegetable production techniques and the sharing of production-related knowledge in general. Secondly, collective organisations are believed to improve the marketing situation of individual producers by providing access to certain markets, facilitating the access to market information, and improving the bargaining power of the individual producer. Thirdly, collective organisations were perceived as a mean to get improved access to financial capital by means of obtaining loans from the organisation itself (savings groups) or by obtaining support from external facilitators.

What type of collective organisations are successfully working and what are their success and failure factors in vegetable value chains?

As it was shown above, the collective organisations engage in vegetable production and marketing have very heterogeneous configurations which is largely a result of the business environment they are operating in. Based on the identification and analysis of the obstacles and advantages of collective action, the focus group discussion and the analysis of the facilitators interventions the following success factors for collective organisations facilitating access for smallholder farmers to vegetable value chains are identified:

- The collective organisation is focussed on a viable business case: The activities of the collective organisation have to be centred on a business case that is potentially profitable, associated with limited risks and has at least a mid-term perspective. Given the trial-and-error process associated with establishing and maintaining a collective organisation in a business environment, concrete business success and scaling up from success cases has shown to be conducive.

- Tight cooperation with the intermediaries from the private sector: Assuming that the collective organisation centres its activities on a viable business case, close cooperation with a strong private sector actor seems essential. The private sector intermediary has the financial and logistical resources as well as the relevant information on recent market developments to support the organisation. High levels of mutual trust between the collective organisation’s members and the private sector partner and an existing history of time in business are facilitating the successfully collaboration.

- Sound management capability: In the fast-moving business environment of complex vegetable value chains, the collective organisation’s management has to be flexible to react to sudden changes and take transparent decisions. Efficient resolution of conflicts among members is crucial.

- Entrepreneurial and innovative spirit of key members: Typically collective organisation are initiated and driven by key members with an entrepreneurial and innovative mind-set. Such qualities are required to tap new business opportunities, acquire new market outlets, or upgrade the mode of operation in terms of processes or structures.

- Focussed on members’ comparative advantages: Successful collective organisations limit their activities to domains where the collective organisation provides a comparative advantage over the individual producer. Among others, this may refer to activities such as providing access to complex value chains, operating a credit savings group, or providing access to production
techniques for achieving the required product quality. Thereby it seems crucial that the degree
to take individual decisions in other fields is fully left to the individual producer. A shared vision
on the goals among the member base minimises potential conflicts.

With regard to configurations of collective organisation with low probability of success the following
failure factors are identified:

- Dependence on external facilitor support without a clear business case: In repeated cases col-
  lective organisations were supported by external facilitors and the organisation’s activity lacks a
  clear business case. Without a viable business strategy, it is likely that the collective organisa-
  tion’s activities will cease to continue once the facilitator withdraws its support.

- Lack of trust between intermediary, collective organisation and its members: Limited levels of
  trust between the private sector intermediary, the collective organisation and its members un-
  dermine efficient cooperation. Intransparent decisions, breach of contracts details, and long de-
  lay of payments have repeatedly led to disintegration of the business relations. Products with
  no-side selling potential minimise the risk of contract breach and to compromise trust between
  the members and the private sector actor.

- Compliance of the supply capacity with dema
  nd: The collective organisation and its member
  have to be able to fulfil the specified demand of the buyer. This refers to the production vol-
  umes as well as to all involved product quality attributes. Clear communication of expectations
  on both sides may prevent potential failure.

How has the collective action and organisation emerged and what was the role of entrepreneur-
ship?

The study has assessed collective agricultural organisations facilitating access to vegetable value
chain Tanzania. The country with its socialist past has a wide – and mostly negative – history of state-
led collective agricultural organisations. On one hand this heritage has resulted in a general culture of
where certain farm related activities are executed collectively, like the maintenance of the roads and
irrigation infrastructure. On the other hand the collective actions that are associated closer with the
individual farm management have the reputation of being inefficient.

Among smallholder participants in vegetable value chain there is an emerging awareness that collec-
tive action may enable them to access complex value chains. Particularly the fresh vegetable export
chain is a widely acclaimed example where participation in a complex value chain has offered benefits
to smallholders by providing them profitability at relatively low risks.
Findings part 3: Facilitator’s interventions

1. Introduction

1.1. Research interest

Problem formulation

Linking smallholders to sophisticated supply chains does not just happen by itself. External facilitation of institutions, such as governmental agricultural extension services, development projects or even agricultural research, are playing a pivotal role in enabling the smallholders to access lucrative markets. While it may be appropriate to initially support a smallholder organisation, sooner or later the farmer group will have to sustain itself without external support.

Hypothesis: External facilitation

External efforts will generally be necessary to get smallholder producers integrated into potentially profitable but demanding value chains, like the domestic high-value supply chains or the export-oriented value chains.

A phasing-out-strategy is essential for the long-term efficacy of the intervention.

Research questions

- Who provided what type of facilitation services to which value chain actors?
- What is the intervention logic of any facilitating institution and do they achieve/have they achieved their goal?
- What happened/will happen when the external facilitator withdraws its support services?
2. Theoretical background

In the following an overview is given on potential interventions of facilitators into value chains. First, a literature review on intervention strategies into agricultural value chains is provided. Then the concept of value chain upgrading is presented, and finally the existing manuals and tools for value chain interventions are presented.

2.1. Literature review on possible intervention strategies

In their review of farmers’ market research between 1940 and the year 2000 Brown (2002) suggests that the farmer markets are a relatively under-researched subject. In the following decade this has changed noticeably with an emerging body of literature on linking farmer to markets with a focus on developing and emerging economies. The growing interest was heavily based upon the rapidly changing agricultural marketing with transactions increasingly embedded into coordinated value chains. The FAO conducted an extensive review on the approaches how to link producers to markets (Shephard 2007). Therein, seven types of possible market linkages are identified: (i) farmer to domestic trader, (ii) farmer to retailer, (iii) linkages through a leading farmer, (iv) linkages through cooperatives, (v) farmer to agro-processor, (vi) farmer to exporter, and finally (vii) contract farming. The review emphasises that these linkages might be used as intervention foci but interventions should not be confined to the direct linkages. Rather, interventions have also to target the provision of an appropriate macro-economic framework. This enabling environment – as we call it subsequently – refers specifically to the policy environment, the legal and regulatory framework, infrastructure, and institutional environment.

Along the same line, but even more specific in terms of differentiating interventions between creating an enabling environment an specific interventions along the linkages is Altenburg in his review on donor approaches to support pro-poor value chains (Altenburg 2007). He distinguishes between “general policies and support programmes with an impact on the structure and development impact of value chains“ and “specific supporting activities for pro-poor value chains”. The interventions for the former are (i) to create and enabling environment for the private sector, (ii) trade and investment policies and export promotion programmes, (iii) tax policy, (iv) policies and programmes for skills development and interventions, (v) financial and non-financial business services, and (vi) support of local economic development. The specific supporting activities for pro-poor value chains on the other hand comprise (i) awareness raising and matching, (ii) supporting spill overs from lead firms, (iii) access to value chain finance, (iv) promotion of inclusive standards, and (iv) franchise development.

The value chain concept is deeply embedded in both reviews. For example Shephard states explicitly in the recommendations that “a value chain approach is required and Altenburg’s whole review is targeted at value chains as the predominant analytical instrument for development of interventions.

Capacity development or capacity building is a central element of various potential interventions in the direct linkages. Bingen et al. (2003) suggest three conceptually different types of capacity building interventions for linking smallholders to markets, namely (i) contract and business interventions enable farmers the "access to goods and services required for production and marketing of a target commodity", (ii) interventions focussing on the promotion of improved technology, and (iii) process and human capacity interventions, focussing on the development of foundation skills and social capital but also facilitate technology adoption and marketing.
## 2.2. Value chain upgrading

The term “upgrading” in the value chain context has emerged prominently from the “Global Value Chain” discourse. Most notably Schmitz and Humphrey (2000) distinguish between three types of value chain upgrading options: First, process upgrading: Firms can upgrade processes which transfers inputs into outputs more efficiently by reorganizing the production system or introducing superior technology. Secondly product upgrading where firms can upgrade by moving into more sophisticated product lines, which can be defined in terms of, increased unit values. Lastly, functional upgrading whereby firms can acquire new functions in the value chain such as design or marketing.

Mitchell & Coles (2011) emphasize that the above typology may appropriately capture upgrade strategies from a firms perspective, but for the upgrading a value chain with a perspective on the rural poor, horizontal and vertical coordination have to be taken into account. They are to be complemented by changes in the enabling environment.

In their comparison between OECD-countries and non-OECD countries context for value chain upgrading Brach & Kappel (2009) conclude that developing countries undertake very little to no original R&D and heavily depend on foreign technology. Hence long-term contracts and subcontracting arrangements within global value chains are an important channel of the needed technology transfer.

## 2.3. Facilitators manuals and tools for linking producers to markets

Following the increased interest of donors in value chain related projects a wealth of manuals and tools for linking farmers to markets has been published in recent years. The most prominent and widely used are GIZ’s Valuelinks manual (GTZ 2007), ILO’s guide on value chain development for decent work (Herr & Muzira 2009), IIED’s guide to multi-stakeholder processes for linking small-scale producers to modern markets (Vermeulen et al. 2008) and CIP’s manual on participatory market chain approaches (Bernet et al. 2006). All of these are extensive documents targeting development practitioners and come with tools and instruments provided for specific tasks.

In their comprehensive review of pertinent manuals for agricultural and forestry products Nang (2011) identify 12 general manuals, 13 guidelines for value chain appraisal and design of interventions. Most of these manuals have a number of steps to be conducted. First the value chains are appraised, then the intervention are designed by targeting opportunities identified in the value chain appraisal. Finally, the interventions are to be implemented and monitored and evaluated.

Such a step-by-step procedure has evident pedagogical advantages, as they are very clear instructive. However in practise many of the actions to be taken do not follow a predefined logic and considerable. Additionally, most of the manual highly focus on the specific interventions along the linkages and give only limited attention to the enabling environment. A notable exception is the recently emerging “making market for the poor” (M4P) approach (Springfield Center 2008). This approach has been promoted strongly by DFID and SDC and its interventions are explicitly not confined at the direct linkages but rather aim at achieving systemic change in the whole market system.
3. Methods

3.1. Methods applied

This chapter heavily draws upon the data and the findings of the preceding two chapters. The initial work on the vegetable value chain typology provided a good overview on the actors involved and the facilitation, which has taken place in the past as well as the current activities of external actors to facilitate vegetable value chains.

The first chapter revealed that facilitators' interventions were highly heterogeneous in terms of scale, actors involved and intervention logic. Together with a low number of facilitator interventions it was decided to opt for a mostly qualitative comparative methodology allowing studying all interventions identified in detail and comparing them. Quantitative data from the producer survey (chapter 2) was used to compare producers involved in interventions with non-involved producers. The qualitative methods applied in collecting the data for this chapter are the following.

- Semi-structured interviews with representatives of the facilitators: With regard to the external facilitators, an interview guide was developed which covered the following topics: Background of the facilitator’s intervention; intervention rationale and logic; target group and beneficiaries; vegetable products and value chain addressed; activities of support accomplished/planned; phasing-out strategy; problems and challenges encountered. A total of 27 semi-structured interviews were conducted with different representatives of facilitators (for both, funding agencies as well as implementing agencies, at project management and project officer level).

- Key informant interviews with other actors of vegetable value chains other than facilitators: Actors included were wholesalers, retailers, consultants, government officials, development workers and consultants, exporters, processors, brokers, and transporters. These interviews were conducted during the work on the typology of vegetable value chains (finding chapter 1). A part of the interviews were devoted to their perception and assessment of external facilitators’ interventions.

- Document study on facilitators project documentation: For all interventions project documentation of the intervention were tried to obtain. This includes project proposals, technical project status reports, final project reports, publications resulting from the intervention, and documentation as provided on the respective websites. It turned out that most facilitators were reluctant in providing internal project documentations and the study had to rely in a large degree on officially published documents and publications.

- Structured questionnaires with individual vegetable producers as detailed in chapter 2 (p.60). The producer survey (p.126) also comprehends a section pertaining to interventions of external facilitators (items 59-63).

- Informal discussions with producer groups and individual producers: For some of the interventions, mostly the ones where the facilitator had on-going activities, it was possible to conduct field visits at the beneficiaries, which were mostly producers. During these field visits a field officer was typically present and was facilitating the discussion and interaction. For each of the selected intervention a minimum of two field visits were conducted.
3.2. Sampling and case study selection

The exploratory research on the vegetable value chain typology provided a sound overview on the activities of facilitators. While we registered a relatively large number of activities by general development agencies, the number that actually addressed vegetable production and marketing was limited. As our research focuses on value chains it was decided to focus exclusively on present or past activities of external facilitators, which intervened in vegetable value chains. This means that a number of interventions addressing exclusively production issues were dropped from the sample. The resulting relatively limited number of interventions allowed us to cover the facilitators’ activities in vegetable value chains in the study area entirely. Thus, no further sampling and selection of case studies was required. Due to the limited number of interventions and the particularities of the study area, the resulting data and interpretation have to be treated with some care when generalising the results to another context, equally as in a case study approach (Denson 2012).

4. Results

4.1. Overview of facilitators and interventions

Based on the methods described in the chapter above, a total of 12 projects and programme were included as facilitator interventions in vegetable value chains to be studied in detail. Subsequently, each intervention is summarised by providing an insight into the goals, the type of intervention, and the funds invested by the facilitator. Table 19 below summarises the included interventions.

Farm Concern

Farm Concern is a private US-based non-profit development NGO aiming at improving rural livelihoods through organic agriculture. The project is entirely based upon their target groups and interventions are tailored to the specific context, their beneficiaries concerns and potential. Thus, with regard to vegetable value chains, they target the existing subsistence value chain by promoting vegetable homestead gardens, as well as encourage improved agricultural practises for improved income from vegetables marketed to rural and urban green markets. Despite having explicitly stated that improved access to markets is an objective, the pertinent interventions remain very much a piecemeal approach and the results in augmenting the integration into green markets are modest.

SHOP

The Smallholder Horticulture Outgrower Promotion (SHOP) project was commissioned by USAID and implemented by ACDI-VOCA. The programme started in 2009 and was concluded in 2007. The programme’s funds totalled to USD 1.3 millions. As the name indicates, the programmes on horticultural products among which vegetable were included. As main focus of intervention, high-value crops in sophisticated value chains were selected with the purpose to promote contract farming as a mean for achieving augmented incomes for smallholder farmers. Implemented interventions included: Management support of a large cooperative in the Usambara Mountains (Usambara Lishe Trust), Support in
Eurep-/GlobalGAP certification of producers and producer groups in the fresh vegetable export value chain.

**Tanzanian Agricultural Productivity Programme (TAPP)**

TAPP is an initiative driven by USAID aiming at improving the productivity and profitability of Agriculture in the whole of Tanzania. The programme has identified three areas where its activities are concentrated, one of which is the present study area. The project started in 2009 and a first phase will end by 2014. The project has no exclusive focus on vegetable production or marketing. Rather it focuses its interventions on high-value agricultural products, of which vegetables are considered to be part. The financial volume budgeted for the first phase amounts to USD 30 millions for the whole national programme. Interventions related to vegetable value chains initiated in the first phase include: Support of vegetable producers for processing (group formation/support, training on agricultural practises, provision of agricultural inputs, linking groups to processor), support of a processor (provision of storage infrastructure), development and deployment of a cell-phone oriented vegetable price information system, support of management of ULT, support of exporters of fresh vegetables and producers group support (infrastructure provision, mediating links between producer groups and exporter).

**Magnite horticultural input provision programme**

The project was funded by the US-based private foundation Magnite. It aims at improving access of vegetable producers in the Usambara mountains to agricultural inputs, particular to high quality seed. Despite being relatively small in volume, it mounts up and builds upon the continuous support of external facilitators for vegetable cultivators in the Usambara Mountains starting two decades ago. Specifically, it supported the Usambara Lishe Trust, a large vegetable producer association in establishing (infrastructure and subsidising materials) and operating (hiring of management personnel) some input procurement outlets in the Usambara Mountains.

**AfriVeg**

AfriVeg was an initiative by the Netherlands-based research and development organisation RAWOO that targeted tomato producers in Ngare’Nanjuki, a major tomato growing area in North-East of Mt. Meru. The intervention is based upon initial research that established that demand for tomato in the large urban green market in remote Mombassa is high and transportation would be in general feasible. Support provided included training in agricultural practises, exposure of producers and local traders to the market places in Mombasa and initial logistical support for transportation of the produce. Although already ahead of the project implementation there has been some delivery to urban tomato markets the project strengthened participation of producers in this market channel. However, do to the remoteness of the market and the very high fluctuation of tomato prices the perception of producers on the sustainability and profitability remain mixed and supplying to these markets remain a challenge.

**Food Water Shelter**

Food water shelter is a small, American-based NGO. Their project in the study area focuses on production and marketing organic vegetables of a community based around a large orphanage and school. The pupils are taught vegetable gardening in their curriculum and the school has its own production area. The vegetables are used first as subsistence foods for the village producers and any excess production is marketed through the own school/orphanage, other institutional buyers, and
Vegetable value chains in northern Tanzania

A high-end outlet selling organic vegetables to expatriates and affluent upper class customers in Arusha downtown.

Tanzanian Association for Horticulture (TAHA)

TAHA is an Tanzanian association of horticultural producers based in Arusha with its membership being primarily based around the Meru and Kilimanjaro area. The initiative started in the 1990’s and is predominantly driven by large, some of them multi-national horticultural industries. These are mostly flower and seed producers that are using the favourable agro-ecological conditions and the relatively low labour cost to produce cut flowers and seeds (flowers and vegetables) for the high-end international market. With the recent emergence of out-grower-schemes TAHA tries to expand its membership base also to smallholder producer. The association’s activities can be divided into two activity lines. Firstly, TAHA advocates for a favourable enabling environment for the horticultural sector by means of advocacy, public relations and media work. Secondly, TAHA implements various projects that mainly target at improving the infrastructure of the horticultural industry. Most prominently, TAHA was instrumental in further expanding the capacity and enhancing the reliability of the air-cargo facilities at the Kilimanjaro International Airport. While claiming to represent the whole horticultural sector, TAHA’s engagement focuses on complex value chains with a particular emphasis on the fresh (vegetable) export value.

Floresta

Floresta is an American-based NGO aiming at promoting organic agriculture to improve the livelihoods of impoverished rural producers. Their projects are anchored in rural communities and include a range of activities to improve the livelihoods of their beneficiaries. In the project area, they have implemented in three sites a homestead vegetable garden project where emphasis was put on improving the production through proper application of organic cultivation practises. As the beneficiaries expanded their production area and also aimed at selling vegetables as a cash crop, the project have gradually moved into marketing issues. Thereby they first targeted the locally available rural green markets, but Floresta has expressed interest of also entering into the fresh vegetable exports with their producers.

AMSDP

The Agricultural Marketing System Development programme was an initiative funded by the IFAD, AfDB, SDC, Danida and the government of Tanzania. With a total funding amount of USD 24 millions it was a relatively large programme and it targeted two agriculturally highly productive areas in the North and the South of Tanzania. The activities comprised ranged from awareness creation at national policy level, improving the taxation system, strengthening producer groups, facilitating market information systems, improving market infrastructure, and capacitating district administration to facilitate road infrastructure. While most of the activities were not directly related to vegetables, there were some producers groups organised and trained the study area. However, hardly any of those vegetable producer groups were reported operational after the project’s end.

SCF

The Small and Medium Enterprise Competitiveness Facility (SCF) is a Danish-funded development project that provides funding for small and medium enterprises in the agri-business sector in the whole country. Thus, in most cases they target small and medium sized enterprises like processors,
exporters further downstream in the value chain. The means of operations are grants and loans for infrastructure and operations as well as assistance for start-up enter businesses. They operated demand-driven and their funding decisions are based upon the assessment of business plans. Interventions of SCF in the study area include the support of processors for investments loans, exporters for cooling and packaging facility, and cooling facilities for producer groups of export vegetables (through the exporter).

**CSDI**

The Center for Sustainable Development Initiatives has implemented a project to improve the agricultural business environment in Tanzania. The project was funded by the United States African Development Foundation. The main activity was to provide grants and loans for promising business ventures. Within the study area, the CSID project has provided grants and loans to actors within the fresh vegetable exports, namely loans for packaging and cooling infrastructure to the exporter and grants for cooling facilities for farmer groups supplying fresh vegetables for export.

**Karatu vegetable project**

The Karatu vegetable project is a project funded and implemented by a small international NGO. The project pursues community-based approach and organised vegetable producers in groups. Through the groups improved agricultural practises are promoted and the groups are encouraged to link to urban markets.

The table below summarises the main characteristics of the interventions of external facilitators identified in the study area.

**Table 19: List of interventions by external facilitors in the study area**

<table>
<thead>
<tr>
<th>Project name</th>
<th>Donor</th>
<th>VC types engaged</th>
<th>Interventions</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallholder Horticulture Outgrower Programme (SHOP)</td>
<td>USAID</td>
<td>Export, institutional and tourism</td>
<td>Management support for producer cooperative</td>
<td>Kilimanjaro, Meru, Usambara</td>
</tr>
<tr>
<td>Magnite horticultural input provision programme</td>
<td>Magnite foundation</td>
<td>Local and urban green markets, institutional buyers and tourism</td>
<td>Input provision infrastructure Management capacity Input subsidising</td>
<td>Usambara mountains</td>
</tr>
<tr>
<td>Tanzanian Agricultural Productivity Programme (TAPP)</td>
<td>USAID</td>
<td>Export, urban green markets, processing</td>
<td>Organisation of producer groups Production support Price information system Linking farmers to markets Investments in VC intermediaries (processors, seed producers)</td>
<td>One marketing region in Northern and Southern Tanzania</td>
</tr>
<tr>
<td>Farm Concern</td>
<td>Farm Concern</td>
<td>Local green markets, urban green markets</td>
<td>Production support Organisation of producers Linking farmers to markets</td>
<td>Mbali, Karatu</td>
</tr>
<tr>
<td>Organisation</td>
<td>Sponsors</td>
<td>Services Provided</td>
<td>Functions Delivered</td>
<td>Location</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>----------</td>
</tr>
<tr>
<td>AfrVeg</td>
<td>RAWOO</td>
<td>Urban green markets</td>
<td>Production support</td>
<td>Ngare’nanjuki</td>
</tr>
<tr>
<td>Food Water Shelter</td>
<td>Food Water Shelter</td>
<td>Institutional and tourism, green markets</td>
<td>Production support</td>
<td>Ngaramtoni</td>
</tr>
<tr>
<td>ASDMP</td>
<td>IFAD, AfDB, SDC, DANIDA, GoT</td>
<td>Local and urban green markets</td>
<td>Awareness creation at national policy level</td>
<td>Tanzania (country wide, but specific project areas)</td>
</tr>
<tr>
<td>TAHA</td>
<td>FAO, USAID, own membership fees, others</td>
<td>Export</td>
<td>Investments in airfreight infrastructure</td>
<td>Kilimanjaro, Meru</td>
</tr>
<tr>
<td>Floresta</td>
<td>USAID</td>
<td>Local and urban green markets, exports</td>
<td>Production support</td>
<td>Kilimanjaro</td>
</tr>
<tr>
<td>SCF</td>
<td>DANIDA</td>
<td>Export, processing, seed production</td>
<td>Elaboration of market studies</td>
<td>Tanzania (whole country)</td>
</tr>
<tr>
<td>Karatu vegetable project</td>
<td>Fert</td>
<td>Local green markets</td>
<td>Production support</td>
<td>Karatu</td>
</tr>
<tr>
<td>CSDI</td>
<td>US African Development Foundation</td>
<td>Exports</td>
<td>Provision of infrastructure and capital for producers and exporters</td>
<td>Tanzania (whole country)</td>
</tr>
</tbody>
</table>

The map below provides an overview on the geographical locations of the interventions.
The interventions of the facilitators focus on vegetables the geographical locations are thus highly concentrated in the areas suitable for vegetable cultivation. These are the identical areas that were identified as study area and as shown in the first chapter and depend on the availability of water for irrigation, suitable agro-ecological conditions, and abundance of road infrastructure. Thus, the main intervention areas are concentrated in the following areas: Meru, Kilimanjaro, Karatu, and the Usambbaras.

### 4.2. Intervention types

**Location of interventions within the value chain**

Based on facilitators project activities described above, the interventions can be categorised along the typical value chain from production to consumption as represented in the table below.

**Table 20: Intervention types along the vegetable value chain**

<table>
<thead>
<tr>
<th>Producer-related</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provision of agricultural inputs, infrastructure, or management training</td>
</tr>
<tr>
<td>• Subsidising of inputs</td>
</tr>
<tr>
<td>• Production support</td>
</tr>
<tr>
<td>• Organisation/strengthening of producer groups</td>
</tr>
<tr>
<td>• Improvement of management capacity of producer group</td>
</tr>
<tr>
<td>• Provision of certification for good agricultural practices</td>
</tr>
</tbody>
</table>
**Between producer and intermediary**
- Linking farmers to markets
- Establishment of price information system

**Intermediaries**
- Provision of investment guarantees for agricultural SME
- Investments in VC intermediaries’ infrastructure (private sector)
- Provision of management and analytical capacity of VC intermediaries

**Enabling environment**
- Provision or upgrade of market infrastructure
- Providing market studies
- Improving road access
- Improving taxation system
- Creating awareness for agricultural marketing at national level

Figure 18 below summarises the frequency of intervention types, i.e. the number of facilitators whose intervention could be classified in the respective types. Please note that each facilitator regularly apply a multitude of interventions, thus more than one intervention type per facilitator are possible.

**Figure 18: Frequency of intervention types**

![Bar chart showing frequency of intervention types]

Thereby it can be concluded that most of the facilitators (10 out of 12) interventions that directly target the producers. Nine out of 12 facilitators target the lineage between producers on downstream value chain actors. Only four out of 12 explicitly target the intermediaries and the same small number focuses on the enabling environment.
In order to understand the intervention of the facilitators, it is instructive to distinguish the facilitators according to their configurations into different types:

- “Small” facilitators: These represent typically small development organisations and they are typically have their own funds, often generated through donations, which are comparably lower than those of the large facilitators. Their annual project budget is typically in the range of USD 10’000 to 100’000. The projects in our sample falling into this type are: Farm Concern, Magnite, AfriVeg, Food Water Shelter, Floresta, and Karatu Vegetable Project.

- “Large” facilitators: These represent medium to large development organisations and the funds for their intervention typically originates from bi- and multilateral donors. The typical annual project budget is above USD 100’000. The projects, which are classified as “large facilitators” are: Shop, TAPP, TAHA, AMSDP, SCD, and CSDI.

This distinction is now applied to the interventions observed as represented in Figure 19 below.

**Figure 19: Frequency of intervention per facilitator type**

![Bar chart showing frequency of intervention per facilitator type](image)

The figure clearly indicates that the small facilitators’ interventions are targeting exclusively the producers and the linkage between the producer and their immediate intermediaries. Thus, it can be concluded that small facilitators predominantly focus on the producers as their immediate target group or beneficiaries. The large facilitators on the other hand engage with all value chain actors, including producers, intermediaries and the enabling environment.

**Facilitator interventions and type of value chains**

Focusing on the type of value chain the facilitators are engaged it is possible to approach from two distinct perspectives. First, the perspective of the facilitators is shown, followed by the beneficiaries or non-beneficiaries respectively from the producer survey as presented and discussed in chapter 2.
First it is to be noted that there are facilitators engaged in all value chains. Figure 20 indicates that the green markets are the value chain with the most interventions. While this is was what was observed in the study area it has to be put into perspective. First, the interventions in the green market value chain are mainly conducted by small development organisation and the financial volume, geographical outreach and duration of these interventions is rather limited. Secondly, as shown in chapter 1 the green markets are by far the value chain with the largest production volume and employment capacity. It can be observed that the large development facilitators tend to focus on the sophisticated value chain types. Given that these value chains only absorb a fraction of the volumes of the green markets this poses crowding on the niches poses room for further interpretation.

Table 21: Beneficiaries and non-beneficiaries according to value chain type

<table>
<thead>
<tr>
<th>Value chain type</th>
<th>Beneficiaries</th>
<th>Non-beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green markets</td>
<td>19 (79.8%)</td>
<td>77 (80.2%)</td>
</tr>
<tr>
<td>Seed production</td>
<td>4 (26.7%)</td>
<td>11 (73.3%)</td>
</tr>
<tr>
<td>Processed vegetables</td>
<td>5 (100%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Institutional buyers and tourism</td>
<td>6 (26.1%)</td>
<td>17 (73.9%)</td>
</tr>
<tr>
<td>Fresh vegetable export</td>
<td>7 (29.2%)</td>
<td>17 (70.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>34 (24.1%)</td>
<td>107 (75.9%)</td>
</tr>
</tbody>
</table>

Correlation analysis showed very low coefficients throughout and no value chain type correlated significantly with facilitation obtained. The strongest correlation was between beneficiaries and the green markets ($r_s = -0.148, p = 0.081$) indicating that vegetable producers who are engaged in green markets are less likely to receive support from external facilitators. Since the sample is not representative with regard to the value chain types the high degree of engagement of external facilitators in the fresh vegetables export value chain is likely to hold true in a representative sample.
4.3. Profile of beneficiary producers vs. non-beneficiary producers

The success rate of an intervention at producer level will highly depend upon the producer’s asset base and capacity. Therefore it is important to see whether producers who are benefitting or have benefitted from support by external facilitators have a different asset base and economic performance. Therefore, first a comparison and a correlation analysis of the capital endowment of beneficiaries and non-beneficiaries is conducted which will be followed by the relation between gross margin and participation in external facilitators interventions. The data used is from the producer survey as described in Chapter 2.

Table 22: Means of and correlations between capital endowment and (non)beneficiaries of interventions

<table>
<thead>
<tr>
<th>Capital endowment</th>
<th>Beneficiaries M</th>
<th>Beneficiaries SD</th>
<th>Non-beneficiaries M</th>
<th>Non-beneficiaries SD</th>
<th>r, (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural capital</td>
<td>.076</td>
<td>1.096</td>
<td>-.020</td>
<td>.983</td>
<td>.221** (.009)</td>
</tr>
<tr>
<td>Economic capital</td>
<td>-.171</td>
<td>.995</td>
<td>.048</td>
<td>1.003</td>
<td>-.102 (.229)</td>
</tr>
<tr>
<td>Human capital</td>
<td>.298</td>
<td>.572</td>
<td>.099</td>
<td>1.090</td>
<td>-.198* (.018)</td>
</tr>
<tr>
<td>Social capital</td>
<td>.285</td>
<td>.996</td>
<td>-.083</td>
<td>.991</td>
<td>.175* (.038)</td>
</tr>
</tbody>
</table>

The mean values of the capital types differ at first glance, their standard deviation is noteworthy. Thus, when comparing the difference of the means between beneficiaries and non-beneficiaries was only significant for human capital and social capital. Thus, the correlation analysis provides some more robust evidence as it indicates for three out of the four relationships a significant correlation. Thus, beneficiaries of interventions by external facilitators are significantly better endowed with natural capital ($r_s=2.221, p=0.09$) but have lower endowment levels of human capital ($r_s=-.198, p=.018$) and social capital ($r_s=1.75, p=.038$).

For illustrative purposes the same data is represented in a spider graph below in Figure 21 below.
Again, it is to be noted that the due to the large standard deviation the means can only be used for illustrative purposes and the main results are also supported by the correlation analysis.

From the asset endowment analysis it can be concluded that the producers have a similar overall asset base whether they are beneficiaries or not from facilitators’ interventions. However, with regard to the specific asset types there are differences. Beneficiaries of interventions typically have higher natural and social capital; while the non-beneficiaries are have higher asset endowment in terms of human capital.

With regard to the economic performance of the producers the achieved gross margin may be used as an indicator. Table 23 below summarises the mean, standard deviation and the correlation coefficient between the two groups.

Table 23: Gross margin of beneficiaries and non-beneficiaries

<table>
<thead>
<tr>
<th>Gross margin in percent</th>
<th>Beneficiaries</th>
<th>Non-beneficiaries</th>
<th>(r, (p))</th>
</tr>
</thead>
<tbody>
<tr>
<td>M=75.44</td>
<td>M=71.87</td>
<td>.113 (.182)</td>
<td></td>
</tr>
<tr>
<td>SD=22.79</td>
<td>SD=20.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The beneficiaries as well as the non-beneficiaries have comparable performance in terms of gross margin with both a high standard deviation. The correlation coefficient is rather low (\(r_s=.113\)) and not significant (\(p=.182\)). Thus, it can be concluded that the gross margin is not different between beneficiaries and non-beneficiaries.

### 5. Interpretation

The results are interpreted by answering each research question individually.

**Who provided what type of facilitation services to which value chain actors?**

An extensive list of facilitation services was identified. These are grouped according to where they intervene along the value chain. At the producer level the facilitation services identified are (i) provision of infrastructure, or management training for producers, (ii) provision or subsidising of agricultural inputs, (iii) production support, (iv) organisation and/or strengthening of producer groups, (v) improvement of management capacity of producer group, (vi) provision of certification for good agricultural practices.

At the interface between the producer and the intermediaries two interventions were observed, linking farmers to markets, and the establishment of price information system.

The interventions targeting value chain actors beyond the producer (intermediaries) were the provision of investment guarantees for agricultural SME, investments in value chain intermediaries’ infrastructure (private sector), and the provision of management and analytical capacity of value chain intermediaries.

The interventions targeting at improving the enabling environment of vegetable value chains were (i) the provision or upgrade of market infrastructure, (ii) the provision of market studies, (iii) improvement
of road access and road infrastructure, (iv) the improvement of the tax system, and (v) creating awareness for agricultural marketing at the national policy level.

In terms of observed frequency the interventions addressing directly producers or the interface between the producers and their immediate intermediaries were clearly the highest. There is not only a focus of the interventions on the production side but also the producers addressed are predominantly smallholders. Interventions directed at actors further downstream the value chain were observed but at lower frequency. The directly targeted beneficiaries of the latter are primarily private SMEs.

In terms of the choice of the value chain type (according to the typology developed in chapter 1) it can be stated, that there is a clear bias towards the more complex value chains. Namely, the fresh vegetable value chain, the institutional buyers and tourism chains, and the seed producers are in terms of number of interventions as well as in terms of financial investments by external facilitators the mostly targeted value chain. Clearly last in the focus of external facilitators’ interventions is the default value chain, the green markets. Considering that the green market is in terms of both product volume and financial turnover by far the most the most important value chain this bias is even more striking.

What is the intervention logic of any facilitating institution and do they achieve/have they achieved their goal?

The intervention strategies observed are very much context-specific and no generic intervention logic may be derived. However, it was observed that the underlying assumption of most facilitators’ interventions is that the integration of (smallholder) producers into vegetable value chain will improve their income and thus improve their livelihood.

The research has shown that the interventions are focusing on the production side of the value chain but for understanding their intervention rationale, we have to take into account the configuration of the facilitators. Thereby two different facilitator types may be distinguished into small and large development organisations.

Firstly, the so-called small development organisations are operating on a relatively low budget. Their funding is typically includes a substantial part of donations by private persons. They are accountable to the donors and in many cases the claim of the small development organisations towards their individual donors is to reduce poverty by improving the livelihood of their beneficiaries. The small development organisations are thus closely focussed on their beneficiaries, which are typically smallholder producers. As matter of fact the interventions of the facilitators identified in this category exclusively focussed on the producers, either by supporting their beneficiaries directly or by supporting to link their beneficiaries to actors further downstream the value chain. The development paradigm behind is mainly based upon the sustainable livelihood approach by directly supporting the beneficiaries through improved production techniques, provision of agricultural inputs, collective marketing, and providing linkage between the beneficiaries and market intermediaries.

Secondly, we distinguish the large development organisations, which are operating at comparatively higher budgets. The funding of their interventions typically originates from bi- and/or multilateral or institutional donors. Again, the large development organisations are accountable towards their donor, but as opposed to the small facilitators, the former are far less obliged to deliver detailed success-stories at the individual beneficiary level. Thus, they have the freedom and the budgetary means to intervene beyond the narrow scope of the producers. Consequently, it was observed that the inter-
vention large development organisations target the producers as well as other value chain actors and the enabling environment. Typically, the interventions of large development organisations comprise a combination of different intervention targeted at various entry points along the value chain. The development paradigm behind is generally broad and does not limit itself to interventions directly targeting producers but also includes downstream actors in the value chain and the enabling environment. Thus the pivotal role of organisations and institutions as stipulated by the recent academic development literature is acknowledged in this intervention logic. The recently emerging M4P ("make markets work for the poor") approach (Springfield Center 2008; Meyer-Stamer 2006) provides a useful analytical framework for such a broad intervention logic is very much in line with such a broad intervention logic.

Regardless of the type of facilitator observed, the interventions targeted at producers and at the linkage between producers and market intermediaries share communality. Although many interventions are essentially targeted at individual producers, the facilitators are reluctant to work operationally with individual smallholder producers. Instead the individual smallholders are organised into producer groups, which is the primary contact entity between the facilitator and the individual producers. Such an approach may be an operationally feasible approach for facilitators given the limited economies of scale and limited budgets of facilitators. The choice for this collective organisation is thus rather determined by operational constraints on behalf of the facilitators rather than the smallholders’ preferences and needs.

A salient feature of the observed intervention logic was the mere absence of a consumer perspective. The focus of the intervention was on the production side, others were observed on the marketing/trading and the enabling environment but no intervention was directly targeting the consumers. In a broad understanding as outlined above, the consumers are an essential part of the whole system and it is to be expected that upgraded value chains will provide consumers with improved food security through lower prices, improved food safety through better quality products and a greater diversity of products. Consumer preferences and their evolvement should be carefully included into the further research and development agenda.

Evaluating the performance of the interventions remains a challenge, not only for research but also for facilitators. First, the research revealed that the monitoring and evaluation tools used were very heterogeneous and its application fragmentary. Secondly, the research was hardly provided with access to monitoring and evaluation reports even where such were available as these were classified internal documents. The informal interviews with the various actors and field visits were thus the only available sources. Where we had access to the available goal hierarchy, the performance level was generally observed higher for project output levels, and considerably dropped when moving to outcomes, and overall goals.

What happened/will happen when the external facilitator withdraws its support services?

The project documentations hardly contained explicit phase-out or exit strategies. Project documentations were most of the time written ahead of the project implementation and thus the focus is on the activities that shall be achieved rather than what happens once the intervention comes to an end. Project documentations are rarely adapted during the project’s progress and course. Indeed, the interviews with project staff revealed that the exit strategy became a pressing task in most projects, often a challenging one. The perspective of the beneficiaries on the withdraw of the support is quite different as it was stated at various occasions that at project’s end the support stopped and the beneficiaries were not able or just did not choose to continue the proposed activities for various reasons.
A key success factor for delivering the planned results of an intervention is the realistic assessment of beneficiary needs, preferences, and capacities and a realistic planning of the required time and resources to implement interventions. The standard operational procedure of facilitators impose collective action onto smallholder producers and organise them in groups is particularly prominent example in this regard. Due to limited management and entrepreneurial capacity of producer groups, facilitators often step-in and act on the producer group’s behalf which might bring a short-termed success but hardly builds up the on-ground management and business capacity, which is essential for the long term success after the facilitators withdrawal.

Additionally, interventions in value chains and particularly in the enabling environment are typically long-term tasks. Despite the rich experience and expertise of some facilitators, the time required for implementing interventions is often underestimated and in many cases surpasses a typical project cycle of two to three years. In this regard collaboration of facilitators with existing structures, particular the existing governmental structures, seems a promising strategy.

Furthermore on the beneficiary side a frequent, so-called donor-dashing was observed. This means that once the project is concluded the beneficiaries are actively looking for support from another facilitator. It was observed at various times that the beneficiaries have a whole history of facilitator support. This applies not only to smallholder producer but also for other value chain actors. This is in line with the fact established (in chapter 2) that getting access to external facilitator support is one of the main reasons for smallholder producers to join a producer group. Thus, the support of the facilitators creates a certain expectation on the producers’ behalf for continuous support. This holds particularly true for the focussed complex value chains, particularly the fresh vegetable export, where there is relatively limited beneficiary base and a very large interest of facilitators.

Also on the facilitators’ side it was observed that their interventions were passed along their projects (and beneficiaries) from one to another. This provides the facilitator a smoothly phasing-out from an intervention smoothly and provides another facilitator with an opportunity for an intervention where investments have already been made.
6. Discussion

In this chapter the results are discussed and final conclusions are drawn. First, the findings are summarised conclusions drawn based upon an assessment of the initially formulated four hypotheses. Subsequently recommendations for the producer, the institutional level and the facilitators are drawn.

7. Summary of findings and conclusions

7.1. Hypotheses and research questions revisited

Hypothesis 1: Value chain structure and governance

The dynamic nature of vegetable value chains calls for sophisticated modes of cooperation and organisation among value chain actors. According to their function as well as to their governance several different value chain types may be distinguished.

In the first findings chapter a typology of value chains was developed. Thereby five different types of value chains for the vegetable sector in Northern Tanzania are empirically identified; namely the rural and urban green markets, seed production, processed vegetables, institutional buyers and tourism, fresh vegetable export value chains. The actors directly involved in the transactions along the value chains were the input suppliers, producers, intermediaries such as brokers and traders, transporters, processors, exporters, wholesalers, retailers and consumers. While many actor types are operating in most value chains, the institutional arrangements between the actors are very distinct among the value chain types. The modes of governance observed ranged from pure spot-market arrangements in green markets, to contract farming with repeated contracts in the seed production, to informal contractual farming complemented by green markets for processed vegetables, to a relational network in the institutional buyers and tourism value chain to the most sophisticated mode of partial vertical integration complemented with outgrower schemes in the fresh vegetable export. According to Menards typology of governance modes a continuum from the green market to the fresh vegetable was identified. The spot-market arrangements at the green markets represents the market-based governance form and the vertical integration in the fresh vegetables exports denotes an almost a hierarchic governance form. In between there are various hybrid governance forms like processing (trust-based), seed production (relational network), and institutional buyers and tourism (leadership). Taking into account the results of the chain’s quality requirements and price fluctuations, it can be observed that with increasing reliability of product quality and decreasing price fluctuation respectively, the mode of governance tends to move along the continuum from market to hierarchy with a clear tendency towards hybrid forms of governance.
Hypothesis 2: Smallholder participation

Long-term participation of smallholder farmers in high-value supply chains is achievable, potentially profitable and improves the livelihoods of smallholders’ households.

Participation of smallholder farmer groups is easier to achieve in domestic value chains than in export-oriented value chains.

The research established that in all value chain types producers with access to less than one hectare were observed. This generally means that participation in sophisticated value chain types is feasible for smallholders. Overall only a low but significant positive correlation between land holding and type of value chain integration could be established. In terms of capital endowment it was shown that the natural and economic capital endowment of producers correlates significantly positive with the degree of value chain integration.

A slight positive correlation between profitability and type of value chain integration was identified. The sophisticated value chain types (fresh vegetables export, tourism and institutional buyers) have a lower standard deviation of the gross margins. The modes of governance in these value chains share the risks between the producer and the intermediaries to a much larger extent than the green markets with their spot-market arrangements.

The domestic green markets represent the default vegetable value chains for any producers including the smallholders. The only capital endowment that had a significant negative correlation with participation in the green market value chain was the financial capital, all other form of capital endowment were not significant.

Hypothesis 3: Collective action and entrepreneurship

Collective action and collective organisation is a potential strategy for smallholder producers to access high-value vegetable supply chain. The decision to engage in a form of collective action is based on the smallholders assessment of costs and benefits of the collective action initiative.

Potential benefits include: Increased efficiencies in procuring and accessing the agricultural inputs, lowered transaction costs in marketing the product, improved access to high-value supply chains, increased negotiation power, increased access to R&D, and political advocacy.

Potential costs include: Loss of independence (individual decision power), and governance cost (time and funds) of collective organisation.

Collective action and organisation of smallholder producers might be enabled by an entrepreneurial spirit of a key actor in the supply chain.

Some degree of horizontal collective action was typically observed as a strategy for participation in sophisticated value chain types. However, in the institutional buyers and tourism value chain there were a number of smallholders who supplied successfully directly to their customers without any horizontal collective action. This value chain type seems to be somewhat the exception as in both, the participation in agriculture-related activities and membership in producer associations had significant low shares.
The motivation for the producer to join a producer organisation was stated the access information, credit, aid from donors and others. The reasons for not-joining were opportunism, lack of trust and the lack of efficiency in/of the producer organisation.

Entrepreneurship and the willingness to try an innovation was observed as key factor for a producer to take the decision to engage in a sophisticated value chain. This entrepreneurship was observed at individual producer level, in the producer organisations, or facilitators, but particularly in key actors of the private sector.

The global transformations of food value chains will continue to shape the vegetable value chains particularly in areas within proximity to urban centres and provide new business opportunities. Tapping these business opportunities for smallholder producer will require entrepreneurial spirit in multiple dimensions. First, smallholder producers have to be willing to venture into these new opportunities and cope with the risks incurred. As smallholders have shown to be able to deliver the required product quality required in sophisticated vegetable value chains at competitive price levels, there is a need for innovative forms of collective organisation for smallholders. Thereby, individual key members with a pronounced entrepreneurial spirit are instrumental for building up successful business cases and for gaining momentum of agricultural collective organisations. Secondly, due to the lack of large-scale vegetable producers, the private sector intermediaries have will have to continue to collaborate with smallholder producers. In order to tap the emerging business opportunities, the private sector actors have to come up with innovative, context-specific approaches to cooperate with smallholder producers. Thirdly, external facilitators aiming at supporting smallholder farmers have to embrace an entrepreneurial spirit by focussing on the business case if they want to achieve long-term participation in value chains. The cooperation between private sector actors and smallholder producers, or their collective organisation respectively, has to be taken into account by any intervention of external facilitators.

Hypothesis 4: External facilitation

External efforts will generally be necessary to get smallholder producers integrated into potentially profitable but demanding value chains, like the domestic high-value supply chains or the export-oriented value chains.

A phasing-out-strategy is essential for the long-term efficacy of the intervention.

While external facilitators often have the objective to “link producers to markets”, the successes were difficult to see on-ground. Throughout all value chain types smallholders were able to participate in sophisticated value chains without any support of external support. Due to the relatively low size of the sophisticated value chains and the facilitators strong engagement therein, the support for sophisticated value chain types was clearly higher. However, in the long run the facilitators will not be in a position to subsidise those smallholders and they have to perform successfully in the business environment on their own behalf.

Due to the fact that facilitators often underestimated the time required to implement activities and achieve results a so-called “donor-dashing” was repeatedly observed where producers continuously get or seek support from various facilitators. It can certainly be questioned whether such institutions provide the right incentive for producers to succeed in the business.
Hardly any explicit phase-out strategies were comprehended in the initial project documentations or observed in the interventions. Rather interventions were started up and at one point in time the implementers realised that the project’s end was approaching and thus the interventions came to an end.

7.2. Reference to the body of literature

Most of the empirical literature on value chain is based upon case studies focussing on a particular value chain. For analytical and operational reasons such a methodology is comprehensible. However, given the strong interdependence between multiple value chains the entire value chains of a sector need to be understood. The study at hand has analysed all value chain in a sector and thus allows deriving robust recommendations for the whole sector, which includes various distinct value chain types.

The academic discourse on linking farmers to markets is highly biased towards emerging, sophisticated value chain types like export production. Thereby the interdependence of these new types of value chains and the existing and default value chains are often neglected. The present research has established that there are various and considerable interactions between the different value chain types and typically the existing default value chain – the green market in our case of vegetables – serve as the backbone of the whole sector.

The new institutional economic theory is well developed. Its empirical foundation is much less advanced. Thereby further refining and above all operationalising the transaction cost concept would be an important step (Wang 2003). Menards (Ménard 2004) typology based on transaction cost and asset specificity was an instructive conceptual model but it was proven difficult to operationalize. The present work suggests that the reliability of product quality is an important variable for determining the value chains governance mode.

The importance of social capital in linking smallholders by collective action to markets is emphasised the literature (Devaux et al. 2009; Markelova et al. 2009). This assumes that smallholder producers participating in more complex value chain types need a higher social capital endowment. However, our data cannot confirm this since there is no significant positive correlation between social capital endowment and value chain integration.

Since vegetables are a high-value product the study contributes to further refining this product type. Thereby it is shown that high unit values do not per se translate into a profitable business opportunity for smallholder producers, rather the mode of governance of the involved value chain seems decisive for the profitability.

Lastly, the present study documents the importance of regional markets in Africa. The observed transitions towards the hybrid forms of governance are exclusively driven by domestic or regional demand. Only the fresh vegetable export value chain, which is in terms of volumes almost negligible, is based upon the demand in industrialised countries.

7.3. Discussion on the research approach

Today value chain analysis is a common research approach. However, its application is usually confined to one or two selected value chain but hardly ever to all value chains identified in an agricultural sector. Focussing on one particular value chain would certainly yield analytical sharpness and makes the con-
ducting the research easier. However, from a producer perspective such an exclusive focus is hardly meaningful. The vast majority of the producers have cultivated various vegetables, which were marketed through multiple value chain. Even of the products assessed in detail in the producer survey almost every fifth producer has marketed that product through more than one value chain type. This observed co-existence and interdependence of value chains calls for a comparative perspective on all the value chains of a sector. Particularly for researching the anticipated spill-over effects of export-oriented value chains into domestic value chains (Battisti et al. 2009) further comparative case studies are needed.

The research approach was confronted with a number of noteworthy challenges. Firstly, the value chain appraisal has yielded sound qualitative data on the institutional and organisational environment of the value chains, which was instrumental in developing the value chain typology. One aspect which would be helpful for further analysis are the traded volumes, which could not even be obtained for the urban green markets.

Secondly, the producer survey was used as the basis for the gross margin analysis. The data collection proved particular difficult when assessing the cost structure of the producers. The producers were generally very willingly sharing their information but the latter was in some cases incomplete since many producers are not fully aware on the costs associated and do not keep records. Developing product-specific checklists and indicative prices for inputs mitigated this challenge. Furthermore the nexus between gross margin, profitability and improved livelihoods could not be established as the data available was confined to the gross margin. Longitudinal producer studies would be a possible research strategy for assessing the causality that integration in complex vegetable value chains result in a high gross margin which leads to high profitability of the farm which will increase the livelihood of the farmer’s family.

The sample selection in the quantitative producer survey is to some degree inclined towards the successful vegetable producers. It was hardly feasible to include unsuccessful producers and those who have stopped cultivating vegetables.

Thirdly, obtaining data form the facilitators proved challenging. Direct information from facilitators might be biased since the facilitators are accountable to their donors and thus it is in their interest to present and document the success stories rather than the failures. Overall it was difficult to obtain project documentations even more so monitoring and evaluation data. Additionally, the duration of the interventions was well beyond the research field phase. The progress of the intervention studied was very heterogeneous ranging from already concluded interventions to projects that were yet in the start-up phase.

The present work is a case study analysing the implications of the emerging global food system on the smallholder producers in Sub-Saharan Africa. The generalisation of the results is confined to similar contexts particularly in developing countries.
8. Development-oriented recommendations

8.1. Producer focus

Vegetable cultivation and marketing in general is highly profitable. The variability of the profitability is considerable, not only among across the products, but also in time (seasonality) and according to value chain type involvement.

The risks for the producer associated with vegetable production are considerable the most prominent ones are crop failure and highly fluctuating prices. The producers need to be aware and be able to cope with these risks before investing into vegetable cultivation. Sophisticated value chains and their contractual arrangements are effectively mitigating these risks. The perishability of vegetables may lead to the classical hold-up situation between the farmer and the intermediary in spot-market arrangements.

Integration of smallholders in sophisticated modern value chains is feasible. The research clearly shows that smallholder involvement in complex value chains is not primarily depending upon their asset base and thus smallholder participation is feasible given the appropriate institutional arrangements.

Collective organisation is often required in sophisticated value chain types since intermediaries down-streams are only willing to cooperate with producer groups rather than many individual smallholder producers. Therefore, horizontal cooperation among producers is required. Producer organisations should be focussed on a viable business case, have sound management capacity, be entrepreneurial and innovative and be focussed on the comparative advantages of its members.

8.2. Policy level

Negligence of the consumer: Most of the development-related focus on agricultural value chain is on the incomes or livelihoods of the producers. Thereby value chains are conceived as an instrument for augmenting the producer’s income and improve the household’s livelihood situation. From a functional perspective a value chain entails all activities that deliver a product (or a service) from the production to consumption. Thus, upgrading of value chain does not only affect the producers but also the consumers. An upgraded value chain may bring about an enhanced efficiency in terms of prices, food quality and safety, or product availability for consumers.

Infrastructure is key for efficient value chains: Confined, congested and oligopolistically operated market infrastructure, particularly at wholesale green markets, have put the wholesalers in a favourable position. There is a large upgrading potential in terms of infrastructure and governance of the urban green markets. While interventions at this level will be difficult to implement due to the politics involved, they have a large potential to improve the institutional environment of the producers and provide better supply for the consumers. Additionally, access to the road network is a prerequisite for participation in any vegetable market beyond the rural green markets and direct sales. Abundant transportation capacity at competitive prices is essential for green markets and even more so for more complex value chain types.
8.3. Facilitators’ interventions

Collective organisation of smallholder producers is the only option for facilitators to engage smallholder production. This is the result of the diseconomies of scale of smallholder producers in their interaction with facilitators.

The focus on export-oriented value chain of fresh fruits and vegetables are only partly justified. From an analytical perspective the export-oriented value chains are a fascinating object of research and for donors they may be attractive to communicate to their clientele. However, the amount of support from donors in the export value chain is tremendous in relation to the value chain’s production volume. Given the scale and considerable upgrading potential in the default value chain a value for money analysis might favour an investment into the green market or other domestic/regional value chains.

The rationale of the facilitators matters for the choice of their type of interventions. The amount of funding and the time of investment until the return (impact) becomes evident favours short-handed interventions. Facilitators should thus be prepared to invest for a minimum period of time and set clear goals.

Any value chain intervention should comprehend a phase-out planning from the project’s onset. Rather than providing market services on their behalf, facilitators should focus on an creating an enabling environment where market actors are providing the services.

Continued engagement of facilitators with producers may lead to a certain donor-dependence and expectations vis-à-vis the facilitators are likely to rise. Thus, facilitators have to set clear objectives based on their value chain analysis, communicate these to the producers implement the intervention accordingly. This is not at all for less participation but one for clear and jointly agreed objectives and once they are achieved, the facilitator should withdraw.

The use of a value chain approach in development cooperation has become widespread. Certainly applying the value chain concept to a market-related development intervention yields analytical sharpness and will lead to a proper analysis of actors involved, their interrelations, the associated institutions and organisations. However, a strict value chain focus tends to highly focus on a particular actor group as beneficiaries and neglect others, particularly the end consumers.

The use of a value chain approach has led that facilitators have provided services as part of their intervention. After the project’s end the services are typically no longer provided. This results in a low sustainability of the facilitators’ intervention. Thus any value chain intervention should comprehend from the onset of the intervention an exit strategy and have a specific plan on how the activities are phased-out but sustainability of the intervention is assured. One approach that has proven very sensitive to the former two arguments (taking into account all market actors and phase-out sensitivity) is the making market work for the poor (M4P) approach that has recently gained attention in the development practise. The approach is highly built upon a value chain methodology but it confines the facilitator to provide an enabling environment which shall bring systemic change in the market system and explicitly devises against direct service provision of its agents but rather the services should be provided by market actors. It is to be seen how this promising approach will perform in the near future.
Annexes

1. References


Barham, J., 2007. Linking farmers to markets: Assessing planned change initiatives to improve the marketing performance on smallholder farmer groups in Northern Tanzania. Graduate School of the University of Florida.


Hazell, P. et al., 2007. The future of small farms for poverty reduction and growth IFPRI, ed. , 42.


Lauret, F., 1983. Sur les études de filières agro-alimentaires, INRA. Available at: http://books.google.ch/books?id=MCKgAAAACAAJ.


Roduner, D., 2004. Analysis of existing theories, methodologies and discussions on value chain approaches within the development cooperation sector.


Salami, A. et al., 2010. Smallholder Agriculture in East Africa: Trends, Constraints and Opportunities.


Shephard, A.W., 2007. Approaches to linking farmers to markets: A review of experiences to date.


2. Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVRDC</td>
<td>World Vegetable Center</td>
</tr>
<tr>
<td>CGIAR</td>
<td>Consultative Group on International Agricultural Research</td>
</tr>
<tr>
<td>CIP</td>
<td>International Potato Center</td>
</tr>
<tr>
<td>DANIDA</td>
<td>Danish International Development Agency</td>
</tr>
<tr>
<td>DFID</td>
<td>Department for International Development of the United Kingdom</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agricultural Organisation of the United Nations</td>
</tr>
<tr>
<td>FFV</td>
<td>Fresh fruits and vegetables</td>
</tr>
<tr>
<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit</td>
</tr>
<tr>
<td>GoT</td>
<td>Government of Tanzania</td>
</tr>
<tr>
<td>GVC</td>
<td>Global value chain</td>
</tr>
<tr>
<td>JRO</td>
<td>Kilimanjaro International Airport</td>
</tr>
<tr>
<td>M4P</td>
<td>Making markets work for the poor</td>
</tr>
<tr>
<td>MoA</td>
<td>Ministry of Agriculture of the Government of Tanzania</td>
</tr>
<tr>
<td>NIE</td>
<td>New institutional economics</td>
</tr>
<tr>
<td>PCA</td>
<td>Principal component analysis</td>
</tr>
<tr>
<td>SCF</td>
<td>Small and Medium Enterprise Competitiveness Facility</td>
</tr>
<tr>
<td>SDC</td>
<td>Swiss Agency for Development and Cooperation</td>
</tr>
<tr>
<td>SME</td>
<td>Small and medium enterprises</td>
</tr>
<tr>
<td>TC</td>
<td>Transaction costs</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>VC</td>
<td>Value chain</td>
</tr>
<tr>
<td>VCA</td>
<td>Value chain analysis</td>
</tr>
<tr>
<td>VED</td>
<td>Village Executive Officer</td>
</tr>
<tr>
<td>WED</td>
<td>Ward Executive Officer</td>
</tr>
</tbody>
</table>
3. List of tables

Table 1: Indicators used for operationalising transaction costs in the agri-food sector 6
Table 2: Methods used in value chain analysis 18
Table 3: Key elements of identified value chain types 21
Table 4: Overview of characteristics of each value chain type 50
Table 5: Gross margins at green markets 63
Table 6: Gross margin in percent per value chain type 64
Table 7: Variables used for the regression models predicting the gross margin 65
Table 8: Regression model predicting gross margin by capital endowment and value chain integration 66
Table 9: Regression models predicting gross margin with individual independent variables and VC-types 67
Table 10: Indicators used for the creation of capital indices 69
Table 11: Mean scores of the capital indices according to VC integration 69
Table 12: Farm sizes in acres according to the value chain integration 72
Table 13: Clustering of producers 73
Table 14: Participation in agricultural-related community activities per value chain type 75
Table 15: Membership in producer associations per value chain type 76
Table 16: Self-reported reasons for joining a producer organisation 77
Table 17: Self-reported reasons for not joining a producer organisation 77
Table 18: Capital requirement for participation in vegetable value chains 81
Table 19: List of interventions by external facilitors in the study area 95
Table 20: Intervention types along the vegetable value chain 97
Table 21: Beneficiaries and non-beneficiaries according to value chain type 100
Table 22: Means of and correlations between capital endowment and (non)beneficiaries of interventions 101
Table 23: Gross margin of beneficiaries and non-beneficiaries 102
4. List of figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Elements of a generic value chain</td>
<td>7</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Schematic representation of research design</td>
<td>14</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Typology of hybrid organisations after Menard (2004)</td>
<td>17</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Generalised organogram of green market places</td>
<td>24</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Mapping of the urban green market value chain</td>
<td>25</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Value chain mapping of rural green markets</td>
<td>27</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Tomato prices at green markets</td>
<td>30</td>
</tr>
<tr>
<td>Figure 8</td>
<td>Coefficients of variation of retail and wholesale prices</td>
<td>30</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Map of the seed production value chain</td>
<td>33</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Map of the processed vegetable value chain</td>
<td>37</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Map of the institutional buyers and tourism value chain</td>
<td>41</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Map of the fresh vegetable exports value chain</td>
<td>45</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Governance modes of vegetable value chain</td>
<td>52</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Distribution of gross margin in the green market chain</td>
<td>64</td>
</tr>
<tr>
<td>Figure 15</td>
<td>Capital endowment according to value chain type integration</td>
<td>71</td>
</tr>
<tr>
<td>Figure 16</td>
<td>Capital endowment profiles per VC-type</td>
<td>72</td>
</tr>
<tr>
<td>Figure 17</td>
<td>Geographical location of facilitators’ interventions</td>
<td>97</td>
</tr>
<tr>
<td>Figure 18</td>
<td>Frequency of intervention types</td>
<td>98</td>
</tr>
<tr>
<td>Figure 19</td>
<td>Frequency of intervention per facilitator type</td>
<td>99</td>
</tr>
<tr>
<td>Figure 20</td>
<td>Number of facilitators per value chain type</td>
<td>100</td>
</tr>
<tr>
<td>Figure 21</td>
<td>Capital endowment of beneficiaries and non-beneficiaries</td>
<td>101</td>
</tr>
</tbody>
</table>
## 5. List of Vegetables

<table>
<thead>
<tr>
<th>Taxonomical name</th>
<th>Common English name</th>
<th>Other English names</th>
<th>Kiswahili name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solanum villosum</td>
<td>Nightshade</td>
<td></td>
<td>Mnavu</td>
</tr>
<tr>
<td>Amaranthus spp.</td>
<td>Amaranth</td>
<td>Amaranthus</td>
<td>Mchichia</td>
</tr>
<tr>
<td>Capsicum frutescens</td>
<td>Chilli peppers</td>
<td>Chilli</td>
<td>Pilipili</td>
</tr>
<tr>
<td>Abelmoschus esculentus</td>
<td>Okra</td>
<td></td>
<td>Bania</td>
</tr>
<tr>
<td>Allium ampeloprasum</td>
<td>Leek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allium cepa</td>
<td>Onion</td>
<td></td>
<td>Kitunguu</td>
</tr>
<tr>
<td>Allium sativum</td>
<td>Garlic</td>
<td></td>
<td>Vitunguuswaumu</td>
</tr>
<tr>
<td>Apium graveolens L.</td>
<td>Celery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta vulgaris subsp. vulgaris</td>
<td>Beet root</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica carinata</td>
<td>Ethiopian mustard</td>
<td>Kale</td>
<td>Sukumawiki</td>
</tr>
<tr>
<td>Brassica oleracea</td>
<td>Cabbage</td>
<td></td>
<td>Kabichi</td>
</tr>
<tr>
<td>Brassica oleracea var. botrytis L.</td>
<td>Cauliflower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica oleracea var. capitata f.</td>
<td>Red cabbage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica oleracea var. silvestris L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brassica rapa ssp. pekinensis</td>
<td>Chinese cabbage</td>
<td>Snow cabbage</td>
<td>Chainizi</td>
</tr>
<tr>
<td>Capsicum</td>
<td>Sweet pepper</td>
<td>Green pepper, Bell pepper</td>
<td>Pilipilihoho</td>
</tr>
<tr>
<td>Cucumis sativus</td>
<td>Cucumber</td>
<td></td>
<td>Tango</td>
</tr>
<tr>
<td>Cucurbita</td>
<td>Pumpkin</td>
<td></td>
<td>Boga</td>
</tr>
<tr>
<td>Cucurbitapepo subsp. pepoconvar.</td>
<td>Zucchini</td>
<td>Courgette</td>
<td></td>
</tr>
<tr>
<td>Daucus carota</td>
<td>Carrot</td>
<td></td>
<td>Karoti</td>
</tr>
<tr>
<td>Foeniculum vulgare</td>
<td>Fennel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactuca sativa</td>
<td>Lettuce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phaseolus vulgaris</td>
<td>Green bean</td>
<td>French bean, runner bean</td>
<td>Maharage machanga</td>
</tr>
<tr>
<td>Pisumsatium</td>
<td>Garden pea</td>
<td>Pea</td>
<td></td>
</tr>
<tr>
<td>Pisumsatium var. macrocarpon</td>
<td>Snow pea</td>
<td>Mangetout; Snap peas; Sugarsnap peas</td>
<td></td>
</tr>
<tr>
<td>Solanum aethiopicum L.</td>
<td>African eggplant</td>
<td>Ngogwe/Nyanyachungu</td>
<td></td>
</tr>
<tr>
<td>Solanuml ycopersicum</td>
<td>Tomato</td>
<td></td>
<td>Nyanya</td>
</tr>
<tr>
<td>Solanum melongena</td>
<td>Eggplant</td>
<td>Aubergine</td>
<td>Bilinganya</td>
</tr>
<tr>
<td>Solanum tuberosum</td>
<td>Potato</td>
<td>Irish potato</td>
<td>Viazi</td>
</tr>
<tr>
<td>Zea mays</td>
<td>(Baby) corn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zingiber officinale</td>
<td>Ginger</td>
<td></td>
<td>Tangawizi</td>
</tr>
</tbody>
</table>
Producer Survey

Demographics of producer

1. Name of interviewee: _____
   _______________________________________

2. How many members does your household have? _____ (Number of adults) ______ (number of dependents)

3.1. Is cultivating vegetables your only source of income?  
       yes [ ]  no [ ]

3.2. If no, which other sources of income do you have?  
       ____________________________

   (list sources of income)

4. For how many years have you grown vegetables? ______ (number of years)

5. Gender of interviewee
       female [ ]  male [ ]

6. Education of interviewee
       no formal schooling [ ]
       primary school [ ]
       secondary school [ ]
       tertiary school [ ]

7. Estimated age of interviewee
       10 - 20 [ ]  21 - 30 [ ]  31 - 40 [ ]  41 - 50 [ ]  51 - 60 [ ]  61 - 70 [ ]

Production (related to the whole farm)

8. What is the size of your farm? _______ (acres)

9. Which area of your farmland do you use to cultivate the products you consume within your household  
   (subsistence)? ____________ (acres)

10. Which area of your farmland do you typically allocate to vegetable cultivation? __________ (acres)

12. Which vegetables have you cultivated during the last 12 months?  
    ____________________________  
    ____________________________  

   (list of vegies)

13. Which area is currently cultivated with vegetables: _____ ___ (acres)

13.1. Which are the vegetables you are currently cultivating?  
       _______________________________
       _______________________________

   (list of vegies)

14. Have you hired labour for your vegetable cultivation in the past years?  
    yes [ ]  no [ ]

14.1. If yes, how many days of labour have you hired last year? ___________ (days)

15. Did any member of your household work as labourer for other farmers during the last year?  
    yes [ ]  no [ ]

15.1. If yes, for how many days during the last year? _______(number of days)

16. Do you use fertiliser for your vegetable farming?  
    Yes [ ]  No [ ]

16.1. If yes, which type:  
       commercial fertiliser [ ]
       manure [ ]
       compost [ ]
       others:___________

17. What sort of seed do you use for your vegetables?  
    All commercial [ ]
    All self-propagated [ ]

18. Do you use pesticides on your vegetables?  
    Yes [ ]  No [ ]

18.1. If yes, which type of pesticides you are using:  
       commercial only [ ]
       home-made only [ ]

19. Where do you get your agricultural inputs?  
   _____________  ______________
   (place of procurement)

19.1. How long does it take you to get there?  
       _______  ______________

   (total travel (one-way) time in minutes)

19.2. What travel costs are incurred?  
       _______ (TZS per way)

20. In most years, do you have difficulties financing agricultural inputs?  
    yes [ ]  no, if yes which ones?_________

21. Regarding the fertility of your land in the past five years, how do you perceive it has changed?  
    The fertility of the soil  
    has decreased highly [ ]  has increased highly [ ]
### Survey of vegetable producers

**Assessment of production costs (for each currently produced vegetable):**

22. Area coverage ____ (acres)  
   Source: [ ] farmer’s knowledge  
   [ ] enumerator’s estimate  
   [ ] GPS

<table>
<thead>
<tr>
<th>Activity details (structure according to</th>
<th>Time used in hours</th>
<th>Direct financial cost in TZS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-planting (land preparation, seed, nursing, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others (land rent, water, etc.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23. Expected yield ____ (amount) of ____ (unit)

---

**Marketing vegetables (for each currently produced vegetable)**

24. To which type of potential buyers do you expect to sell the product?  
   [ ] Broker  
   [ ] Wholesaler  
   [ ] Retailers  
   [ ] Consumers  
   [ ] others: _______

25. How many potential buyers do you expect to have for your produce? _______ (number of potential buyers)

26. To your knowledge, which actors are involved in bringing the produce to the consumers? (Draw sketch of SC)

27. How do you identify a buyer?  
   [ ] gets contacted by buyer  
   [ ] contacts himself a buyer

28. How was the contact to the buyer made?  
   [ ] face-to-face  
   [ ] mobile phone  
   [ ] SMS

29. Do you have repeated transactions with the buyers?  
   [ ] I am always dealing with the same buyers  
   [ ] I am never dealing with the same buyers

30. How many of your buyers do you know by name? _______ (persons)

31. To your experience in price negotiations with buyers, which are the most important factors determining the outcome of the negotiations? Please rank them
   [ ] Price of product in the market
   [ ] Timing
   [ ] Quality of product
   [ ] Others: _______

32. Regarding the outcome of the price negotiations, who is mainly able to set the price.
   [ ] I can entirely set the price  
   [ ] The buyer can entirely set the price

33. When were/will the price of the vegetables be negotiated?  
   [ ] before planting  
   [ ] before harvesting  
   [ ] after harvesting

34. How were the negotiations (prices/amounts/timing) done?  
   [ ] face-to-face  
   [ ] mobile phone  
   [ ] SMS
Survey of vegetable producers

Financial capital

47. Which ones? If yes, what type of irrigation are you using?

46. Do you have access to irrigation?

45. For how many weeks during the year are you NOT able to irrigate? ________(weeks)

44. If you are selling your produce to intermediary actors, what are the reasons you are not marketing your product directly? ____________________________________________________________________________________________

43. What obstacles in marketing your vegetables? ________(TZS/Unit)

42. How often do you go to vegetable market places to fetch market information during the growing season? ________(market place)

41. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

40. How do you manage to finance your farm operations? ____________________________________________________________________________________________

39. What is the current market price of your vegetable ________(TZS/Unit) at _______(market place)

38. What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market price)

37. How easy is it for you to obtain market information? ________(I am perfectly informed)

36. Please indicate whether you own any of the below items, and if yes specify how many/much?

<table>
<thead>
<tr>
<th>Item</th>
<th>Dog</th>
<th>Bicycle</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

35. What information is comprehended in the contract? ____________________________________________________________________________________________

34. How do you manage to finance your farm operations? ____________________________________________________________________________________________

33. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

32. How would you classify the market information received? ________(oral agreement)

31. What is the current market price of your vegetable ________(TZS/Unit) at _______(market place)

30. What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market price)

29. How easy is it for you to obtain market information? ________(I am perfectly informed)

28. Please indicate whether you own any of the below items, and if yes specify how many/much?

<table>
<thead>
<tr>
<th>Item</th>
<th>Dog</th>
<th>Bicycle</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

27. What information is comprehended in the contract? ____________________________________________________________________________________________

26. How do you manage to finance your farm operations? ____________________________________________________________________________________________

25. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

24. How would you classify the market information received? ________(oral agreement)

23. What is the current market price of your vegetable ________(TZS/Unit) at _______(market place)

22. What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market place)

21. How easy is it for you to obtain market information? ________(I am perfectly informed)

20. Please indicate whether you own any of the below items, and if yes specify how many/much?

<table>
<thead>
<tr>
<th>Item</th>
<th>Dog</th>
<th>Bicycle</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. What information is comprehended in the contract? ____________________________________________________________________________________________

19. How do you manage to finance your farm operations? ____________________________________________________________________________________________

18. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

17. How would you classify the market information received? ________(oral agreement)

16. What is the current market price of your vegetable ________(TZS/Unit) at ______(market place)

15. What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market place)

14. How easy is it for you to obtain market information? ________(I am perfectly informed)

13. Please indicate whether you own any of the below items, and if yes specify how many/much?

<table>
<thead>
<tr>
<th>Item</th>
<th>Dog</th>
<th>Bicycle</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. What information is comprehended in the contract? ____________________________________________________________________________________________

11. How do you manage to finance your farm operations? ____________________________________________________________________________________________

10. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

9. How would you classify the market information received? ________(oral agreement)

8. What is the current market price of your vegetable ________(TZS/Unit) at ______(market place)

7. What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market place)

6. How easy is it for you to obtain market information? ________(I am perfectly informed)

5. Please indicate whether you own any of the below items, and if yes specify how many/much?

<table>
<thead>
<tr>
<th>Item</th>
<th>Dog</th>
<th>Bicycle</th>
<th>Tractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing machine (milling, oil, roasting, etc)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile phone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand hoe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxen plough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. What information is comprehended in the contract? ____________________________________________________________________________________________

3. How do you manage to finance your farm operations? ____________________________________________________________________________________________

2. What are your main source of information regarding market information and prices? ____________________________________________________________________________________________

1. How would you classify the market information received? ________(oral agreement)

0. What is the current market price of your vegetable ________(TZS/Unit) at ______(market place)

- What price do you expect to sell your vegetable ________(TZS/Unit) at ______(market place)

- How easy is it for you to obtain market information? ________(I am perfectly informed)
54. Are you a member of any of the above organisations?  
   □ Yes  □ No  

55. If yes, of which organisation are you a member?  

56. What are the reasons for joining the organisations?  

57. What are the reasons for not joining the organisations?  

58. Are there any activities you are undertaking jointly with other farmers?  
   □ Yes  □ No  

58.1. If yes, which ones?  

59. There are quite a number of developmental organisations interested in vegetable production. Have you ever benefited of any support of any external agency?  
   □ Yes  □ No  

60. If yes, please list the agencies and their interventions:  

61. Assuming the Tanzanian government wanted to support the vegetable sector, what would be the most needed intervention?  

62. Is there an agricultural extensionist responsible for your area?  
   □ Yes  □ No  

62.1. Within the last year, how many times have you received advice or training by an agricultural extensionist?  
   (number of times in the last year)  

63. According to your judgement, which are the most relevant organisations or initiatives for you as a vegetable grower?  
   (list and comment in order of appearance)  

64. Further remarks and comments:  

Thanks very much for the time taken and for providing the information!  
If you are interested in the results of the research you can leave your name and email/telephone number, so we will report the results back to you once the research is concluded.  

Email:  
Mobile:  

Survey of vegetable producers
Wholesale and retail transactions at green markets: The survey of vegetable wholesaling and retailing: Actors, chains, and strategies.

1. Name of seller: _______________________

2. Gender of seller: 
- male 
- female 

3. How long have you sold vegetables? 
- _____ years

4. Do you have repeated transactions with the same sellers? 
- yes 
- no

5. Gender of buyer: 
- male 
- female 

6. From which source do you buy your main source of income? 
- yes 
- no

7. Which type of vegetables do you currently sell? 
- nightshade
- onion
- potato
- cucumber
- okra
- carrot
- green bean
- cauliflower
- broccoli
- zucchini
- pumpkin
- eggplant
- sweet pepper
- ginger
- green bean
- cabbage
- tomato
- amaranth
- leafy vegetables
- snow pea
- garlic
- african eggplant
- tomato
- broccoli
- myself
- public transport
- collective transportation with other sellers
- individually hired transporter

8. Do you sell any other vegetables during other seasons of the year? 
- yes 
- no

9. What is your main source of income? 
- selling vegetables
- others: ________________________

10. How much have you paid for the purchase of the product? 
- 20 - 10
- 30 - 20
- 40 - 30
- 50 - 40
- 60 - 50
- 70 - 60

11. Where have you bought the product? 
- ______________________________________

12. How many times is the product transacted until you buy it? 
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

13. How many sales transactions do you conduct in a day? 
- _________ (amount per unit)

14. With how many different sellers do you buy from? 
- _________ (to be filled for each selling vegetable type)

15. How do you obtain information on product prices and availability? 
- _________ (multiple checking allowed)

16. Who is involved in transporting the product to the market? 
- ______________________________________

17. What is the amount you are expected to sell on an average day? 
- _________ (amount per unit)

18. Where do you think the product is originating from? 
- ______________________________________

19. How many transactions times is the product transacted until you buy it? 
- _________

20. How much have you paid for the purchase of the product? 
- _________ (amount in TZS)

21. Which other sources of income do you have? 
- ______________________________________

22. How do you assess the quality of the product? 
- ______________________________________

23. Are you encountering any problems in assessing the product quality? 
- yes 
- no

24. How many times a week do you sell at wholesale and retail markets? 
- _________

25. How many times a week do you buy at other markets? 
- _________

26. Name of seller: _______________________

27. Name of buyer: _______________________

28. Date and time of survey: _______________________

29. Market place: _______________________

30. Questionnaire number: _______________________

31. Questionnaire: _______________________

32. Green market survey: _______________________

Closing questions

18.1 What are you doing with the products you won’t sell today? ________________________________
18.2 How high would you estimate the wastage you have to throw away? _______________________
19. What is the reason for you to trade these products or the mix? ____________________________
20.1 Are you doing any business activity together with other retailers? □ yes □ no
20.2 Which ones: __________________
21.1 What are the total sales of an average sales day? _______ TZS
21.2 What is the total profit of an average sales day? _______ TZS
21.3 What is the working capital you are operating on? _______ TZS
21.4 How did you manage to obtain the working capital?
□ own savings □ bank loan □ savings group □ others: _______
22.1 Do you think you will remain in business for the coming years? □ yes □ no
22.2 Why? ______________________________
23. What do you consider to be the greatest obstacles for doing business in the vegetable sector?
________________________________
24. Further remarks and comments:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Thanks very much for the time taken and for providing the information!
If you are interested in the results of the research you can leave your name and email/telephone number, so we
will report the results back to you once the research is concluded.
25.1/2 Email: ___________ Mobile: _______________
Acknowledgments

The present thesis marks the end point of an intense process with ups und downs during the past five years. The whole research would not have been possible without the dedicated support of many individuals. I am highly indebted to all of them and would also like to express my gratitude to the many that are not personally mentioned.

There are many persons at ETH Zurich to acknowledge and foremost in this list are the supervisors of the thesis. Prof. Bernard Lehmann for his primary supervision, his valuable advice and his continuous support during the entire five years. I thank Prof. Stefanie Engel for her willingness to resume the principal supervision after Prof. Lehmann has left the ETH Zurich. Dr. Dominique Barjolle has provided most valuable supervision and advice during the data analysis and write-up phase of the thesis. I thank her very much for the constructive inputs provided during our many discussions but also for her continued believe and support in me and my project – also in times of low morale. Dr. Sophie Réviron was instrumental in developing the project proposal and specifying the research methodology. I would also like to thank the North-South Centre at ETH Zurich and SDC for funding this research. The dedication of Dr. Barbara Becker for Agriculture for Development was a true source of inspiration to me and motivated me to pursue further research. Furthermore I owe thanks to Dr. Simon Briner and one anonymous reviewer for their constructive feedback on a draft of the thesis.

I am deeply grateful to the many persons I had the opportunity to interact with during the fieldwork. This pertains to the more than 200 interview partners. I am thankful for their willingness to share their knowledge. These persons have not only enlarged my knowledge on an academic subject but also opened my eyes for the realities of the livelihoods in rural Tanzania.

The Regional Center for Africa of the World Vegetable Centre (AVRDC-RCA) in Arusha has provided the base for the 18 months of fieldwork in Tanzania. AVRDC-RCA’s support was indispensible for conducting the research, particularly in establishing contacts to all the stakeholders through their extensive network. I thank Dr. Abdou Tenkouano for his willingness to host me as well as for his support provided, and Philip Ndungu for his valuable advice on logistics and administration. Without Johannes Mkombozi the actual data collection would not have been possible. His persistent dedication as research assistant and translator during the various surveys and the data collection has undoubtedly led to a large amount of data but as least as important he has successfully acted as a facilitator in bridging our cultural differences – asante sana.

Foremost, I am indebted to great thanks to my wife Martina and my kids Anna-Lena, Xaver, and Wilma. Without their willingness to move to Arusha for the fieldwork phase this thesis would not be published now. I was out of the house or in office during too many workdays, evenings and weekends. However, our family environment provided me with a sound rooting in “regular” live allowing me to do something else rather than sitting in front of a computer and work on the thesis. My most sincere thanks go to my wife Martina – thank you for your understanding, your love and your patience. I look forward to having an even brighter journey ahead of us. Lastly, I would also like to express my thanks to my parents for their continued support and encouragement not only during the past five years but even more so for the previous years.