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<p><i>Task 8.2 Baseline Study:</i></p> <p>Approaching Food Security from an Innovation systems perspective (WP 8.2)</p>	
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Part I: Approaching Food Security from an Innovation systems perspective

By Anett Kuntosch, Bettina König and Wolfgang Bokelmann

Summary

Food Security (FS) is a prevailing challenge that is additionally intensified by the impacts of climate change or the increasing scarcity of natural resources. Finding innovative solutions which address this challenge is a key concern of Trans-SEC. Within this context, this contribution aims in a first step to explore conditions for food security innovations in Tanzania. We argue that an innovation system framework is appropriate to study those conditions and processes, because it acknowledges the complex nature of innovation processes. This is taken up in innovation systems literature which states that innovations, also in a majority world context, are a result of complex multilevel- and actor-interactions (Hall, 2003; Lundvall, 2009).

We apply the heuristic concept of innovation system research as an analytical framework to conduct our empirical work on food security conditions and its specific characteristics in Tanzania. The approach assists the understanding of innovation processes in a systemic way; transcending input and output analyses, as well as identifying interlinkages between system elements and levels. Based upon this, pinpointing main obstacles, but also factors promoting food security innovations is a major research outcome.

The research was conducted using a mixed-method approach. Secondary literature was analyzed on a national and regional level, allowing for general system-information and developing an empirical research strategy. Semi-structured expert interviews on national and regional level (with experts from extension, research, farmer associations, NGOs) were conducted. On a village level group discussions with farmer groups were carried out in order to understand how innovation processes take place in practice.

Preliminary results from the literature review, interviews and group discussions revealed that 1) there is a perceived “gap” between regional and village level, with communication regarding FS innovations between these levels being disturbed. 2) Government and non-government actions need better cross level coordination to have a sustainable impact. Interviewees therefore strongly highlighted 3) a need for institutional innovations besides technical ones that improve communication across governance levels and 4) raised as a problem, that research was mainly donor and not demand driven, which was perceived as a main obstacle by farmers.



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List of Abbreviations

AEO	Agricultural Extension Officer
AIS	Agricultural Innovation System
AKIS	Agricultural Knowledge and Information System
AR&D	Agricultural Research and Development
ARI	Agricultural Research Institute
ASA	Agricultural Seed Agency
ASDP	Agricultural Sector Development Program
ASDS	Agricultural Sector Development Strategy
ASP	Agricultural Service Provider
BRN	Big Results Now Initiative
CCS	Case Study Sites
CSO	Civil Society Organization
CODERT	Community Development and Relief Trust
CORMA	Client Oriented Research Management
DADP	District Agricultural Development Plan
DAICO	District Agricultural Irrigation and Cooperative Officer
DANIDA	Danish Ministry of Foreign Affairs
DITSL	Deutsche Institut für Tropische und Subtropische Landwirtschaft
DRT	Department of Research and Training
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign Direct Investment
FG	Farmer Group
FGD	Farmer Group Discussions
FO	Farmers Organization
FS	Food Security
FVC	Food Value Chain
GD	Group Discussion
GDP	Gross Domestic Product
HH	Household Survey (Trans-SEC)
Ibid.	ibidem
ICRA	International Centre for development oriented research in Agriculture
ICT	Information and Communication Technology
IER	Institut d'Économie Rurale
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
INADES	Institut Africain pour le Développement Économique et Social
IP	Innovation Process
IPs	Innovation Platforms
IS	Innovation System



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LDC	Least Developed Countries
LIC	Local Investment Climate
LISF	Local Innovation Support Funds
MAFC	Ministry Agriculture and Cooperatives
MKUKUTA	Mkakati wa Kukuza Uchumi na Kupunguza Umaskini Tanzania
MVIWATA	Mtandao wa Vikundi vya Wakulima Tanzania
NARS	National Agricultural Research System
NGO	Non-governmental Organization
NFRA	National Food reserve Agency
OECD	Organization for Economic Co-operation and Development
PELUM	Participatory Ecological Land Use Management
PID	Participatory Innovation Development
PMO	Prime Minister's Office
PPP	Public Private Partnership
PROLINNOVA	Promoting Local Innovation
PRS	Poverty Reduction Strategy
PRSP	Poverty Reduction Strategy Paper
RAAIS	Rapid Appraisal of Agricultural Innovation Systems
RAAKS	Rapid Appraisal of Agricultural Knowledge Systems
RLDC	Rural Livelihood Development Company
SACCOS	Savings and Credit Cooperative Organizations
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SLA	Sustainable Livelihood Approach
SOLINSA	Support of Learning and Innovation Networks for Sustainable Agriculture
SSA	Sub Saharan Africa
STIPRO	Science, Technology and Innovation Policy Research Organization
SUA	Sokoine University of Agriculture
TADB	Tanzania Agricultural Development Bank
TAFORI	Tanzania Forestry Research Institute
TAFSIP	Tanzania Agriculture and Food Security Investment Plan
TASAF	Tanzania Social Action Fund
TNBC	Tanzania National Business Council
TNFC	Tanzanian National Food Centre
TOSCI	Tanzanian Official Seed Certification Institute
TPRI	Tropical Pesticides Research Institute
TSP	Technology Supply Push
TZ	Tanzania
TZS	Tanzanian Schillings
UMATA	Usafi Wa Mazingira Tanzania
UNDP	United Nations Development Program
UPS	Upgrading Strategies
USAID	United States Agency for International Development
VEO	Village Executive Officer



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WHO	World Health Organization
WEF	WORLD Economic Forum
WEO	Ward Extension Officer
WFP	World Food Programme
WP	Work Package
ZALF	Zentrum für Agrarlandschaftsforschung (Centre for Agricultural Landscape Research)
ZARDI	Zonal Agricultural Research and Development Institute



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1. Introduction

Food insecurity is a prevailing challenge and is characterized to be a wicked problem (Latjesteijn and Rabbinge, 2012). Wicked problems are characterized as *“complex social - environmental issues [...] that cannot be solved with existing modes of inquiry and decision making”* and *“they are part of the society that generates them”* (Brown et al. 2010: 4) and which require system innovations (Latesteijn and Rabbinge, 2012). Wicked problems involve multiple interests and outcomes and their causes cannot be reduced to a single factor. Against this background Task 8.2 within the Trans-SEC project, explores general frameworks that can be used to describe the conditions for Food Security Innovation Processes in four Case Study Sites (CSS) of Tanzania. The task aims to look at Food Security innovations in a systemic way, revealing interdependencies and interactions between the different levels influencing food security innovations.

To begin with, agriculture is a main sector in Tanzania’s economy; generating more than 30 % of the GDP compared to 20 % in overall Africa (Benard et al., 2014). More than 80 % of the Tanzanian population is employed in the agricultural sector (Diyamett et al., 2012), most of them in the rural areas. At the same time, industry accounts for only 16 % of Tanzania’s GDP, which - most importantly- includes the mining industry in the north of the country. Contrasting with this numbers, we find investment and re-investment in agriculture and agricultural services to be very low in two regards: a) compared to importance of the sector and b) to international standards. The Asian states invest 8-14 % of their national budgets in agriculture and most other African countries invest around 4% (Hounkonnou et al., 2012; Akroyd and Smith 2007). In Tanzania (TZ) the reinvestment of agricultural GDP in e.g. provision of agricultural services is only 2, 7 %.

Agricultural and food policy has been influenced by many stakeholders from inside and outside the country for many years, often focusing divergent strategies. Haug and Hella (2013) argue, that the different strategies ranging from poverty reduction to structural adjustment or from public sector development programs to value chain thinking left the government only a little chance to develop a coherent and long term policy (ibid.). Additionally, Tanzania is one of the main receivers of Foreign Direct Investments (FDIs) e.g. targeting the food and beverages industry, in Africa (Goedhyus, 2007). Despite these efforts upgrading of technological standards, spillover of knowledge or improvement of R&D could not be documented or measured or proved in studies (ibid.).



Approaching Food Security from an innovation perspective

In 2014, the number of Tanzanians affected by food insecurity was 16, 8 million people, equaling 32, 1 % of the total population (FAO, 2015). The different TZ regions are affected by Food Insecurity by unlike degrees: e.g. Dodoma: 30-50 %, Singida: 50-85 %, Morogoro: 10-20 % or Tanga with 5-10 % (WFP, 2007). Food insecurity therefore stays to be a severe problem in the country, specifically in rural areas. Consequently, Tanzanian policy has addressed the issue throughout the decades with changing strategies; focusing e. g. on food supply in the 70ies and food access in the 80ies (Matunga, 2008). Another way to fight poverty is **innovation**, providing a way for the economies of developing countries` to participate in global value chains (Siyanbola et al., 2012). When talking about innovation, innovation uptake and the ability to innovate in developing countries, we can expect to find different conditions compared to OECD countries. For example are actor constellations within developing innovation systems different from OECD countries: Institutions and governments play a more important and even leading role, because markets and SME structures are not quite as mature. Furthermore we find institutional frameworks to be less formalized (Lundvall et al., 2009 and Worldbank, 2012, Siyanbola, 2011) and small producers / farmers playing only a subordinate role in innovation systems of low-income countries (ibid.). Structures in developing countries are characterized by low-average productivity and low incomes. Therefore, technologically advanced projects do typically have negative dissemination effects, due to high entry barriers for regional and local value chain stakeholders (Lundvall et al., 2009). In this regard, Muchie and Baskaran (2012) argue that it is important to create, what they call for *locally centered community systems* of innovation to really be able to address Africa`s rural problems. This activity should be gathered along the issues of learning, knowledge and competence building while addressing major issues such as policies, incentives or institutions as mentioned by UNDP (Haug and Hella, 2013).

In Tanzania, the alleviation of poverty and food insecurity is approached by numerous organizations, NGOs or governments, leaving the question why only a small percentage of suggested innovations are finally taken up at a local level. In this context, Hounkonnou et al. (2012) give the example that out of 1.000 technical innovations written down in a booklet for IER (Institut d`Economie Rurale) only a dozen was really implemented on a farm level. Now, the aim of Trans-SEC is to successfully implement upgrading strategies (UPS) and to disseminate those strategies in the CSS. The question is *what do we need to know about the system and the wider conditions for*



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successful uptake in the mentioned regions? Referring to the aforementioned, the idea of looking at food security from an innovation systems perspective in Task 8.2 seems feasible.

The sectoral innovation system approaches as suggested by Malerba (2002, 2004) provide us with suitable conceptual, but not methodological frameworks for the description and analysis of innovation systems. Innovation system frameworks, amongst them the framework by Malerba are recognized to be suitable tools – in the sense of analytical frameworks- to study agricultural innovation in developing countries (Hall, 2003). In Trans-SEC we have to take into consideration specific the characteristics of the Food/Agricultural sector of Tanzania (in the 2 CSS Morogoro and Dodoma). The primary aim of Task 8.2. is to give input for the dissemination strategy (Task 8.3). Task 8.2 therefore transcends the project borders aiming to understand the wider conditions on which small scale subsistence farmers (as a target group of the project) base decisions for or against food security innovation strategies; that could help to mitigate problems aligned to food insecurity. Therefore, we consider different levels and we also take into account knowledge and actors from outside Trans-SEC to inform Trans-SEC activities. The next figure shows, how our Task can be connected to the broader framework of Trans-SEC (see **Figure 1**):

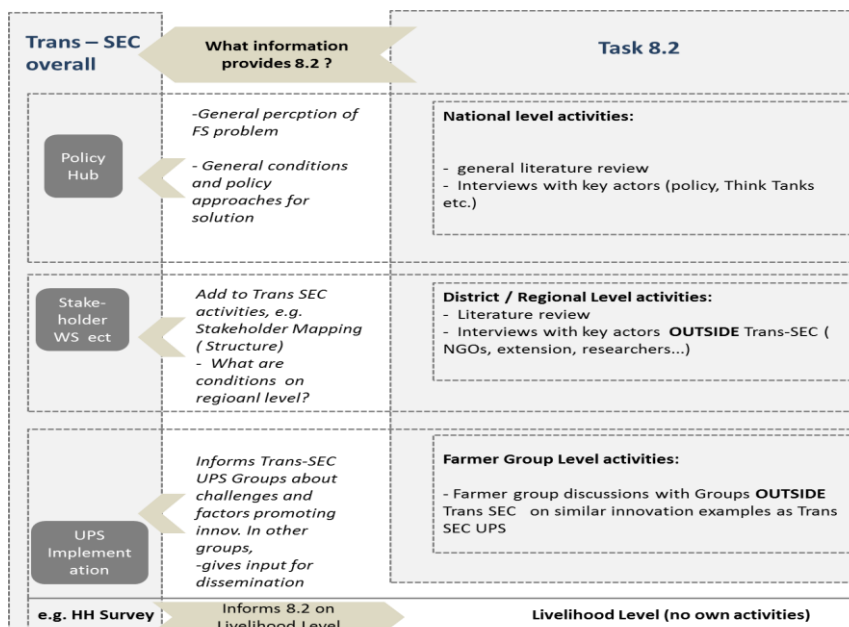


Figure 1 Contribution of 8.2 to the broader Trans-SEC research framework and connection to other activities (Baseline)

As can be seen in the Figure above, Task 8.2 can feed into activities on different levels of Trans-SEC. On a national level it can provide some information about general conditions for FS innovations. On



a farmer groups level it can give input about challenges and factors promoting Food Security innovation processes in the CSS. The results are drawn from 8.2's interviews with already existing farmer groups outside Trans-SEC. Additionally other Trans-SEC activities can give input to 8.2; e.g. valuable information on the situation of single farmers and the general understanding of innovation and innovation processes has been taken up under the overall HH survey.

The next passage addresses the theoretical background from which the methodological approach is derived. The result section will summarize the results from literature review, expert interviews and farmer group discussions. The discussion section will deal with the question, which further research is needed within Trans-SEC in WP8.2 to feed in the dissemination strategy.

2. Theoretical Background

It was made clear in the introduction that for implementation and dissemination of Upgrading Strategies (UPS), which is a major aim of Trans-SEC, a deeper understanding of the innovations and innovation processes on the ground is needed. We would argue that this requires a holistic / systemic approach. At first we need to define the main terms used in Task 8.2 to produce a joint knowledge base.¹

Definitions

Already until the early 90ies, more than 30 definitions for *Food Security* existed (Maxwell and Smith, 1992). In the Trans-SEC proposal it was defined as follows: "*when all people at all times have access to sufficient, save, nutritious food to maintain a healthy and active life*" (USAID, 2013). This includes physical and economic access to food that meets people's dietary needs as well as their food preferences (Proposal Trans-SEC, Annex I: Glossary). Food Security incorporates three main components: food availability, food access and food utilization (USAID, 2013) first if all three aforementioned dimensions are fulfilled someone is food secure (FAO, 2008). According to the same source, there are different kinds of Food Insecurity which are characterized as follows: 1) *chronic food insecurity* is when food insecurity is predictable and a long term problem for the people affected. Type 2) is *transitory food insecurity* which occurs suddenly, and is therefore not predictable but has a shorter duration. At 3) *seasonal food insecurity* follows cyclical patterns and is characterized

¹ The clarifying of definitions is still pending in Trans-SEC. Task 8.2 has contributed to this discussion insofar to bring in definitions for innovation and innovation systems (during the 2014 and 2015 annual meeting). This is still being discussed among project members.



by inadequate availability and access to food. In this report we refer to transitory food insecurity as well as to seasonal food insecurity, as some farmers are food insecure specifically just before harvesting seasons².

In the literature on innovation and innovation systems in developing countries there is no overall definition what an *innovation* is. Diyamett (2012) discusses an innovation cluster in Tanzania and suggests that innovation is both: *“the process of introducing something new and the new thing itself.”*

The author furthermore highlights that market and organizational innovations support product and process innovations (Diyamett, 2012: 131). Another broader and developed oriented definition is by Johnson and Lundvall, (2003: 15): *“Innovation is seen as a continuous cumulative process involving not only radical and incremental innovation but also the diffusion, absorption and use of innovation.”* This definition thereby includes the ideas of learning and ongoing activities and allows for a more comprehensive and reflective perspective (ibid.). On a household level: innovativeness means e.g. *changing farming practices in order to avoid food insecurity* (Kristjanson et al., 2012).

For *innovation systems* we would use a definition by Lundvall (1992) taken from a developing country context: *“the elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge, [...]”*.

Trans-SEC focuses strongly on the dissemination of the so called UPS. In this regard Rogers (2003: 15-18) mentions that innovations have different attributes, namely: *relative advantage, compatibility, complexity, trialability and observability* which determine at which rate those innovations can be disseminated. This has specifically to be considered in the developing country context where high compatibility and low complexity are prerequisites for a good uptake of innovations at the farm level.

Now, literature already distinguishes different approaches to describe agricultural and/or food systems on different levels of interaction. Those different approaches have to be mentioned here, because they define innovation in different ways and they are also the theoretical background to many experts in the TZ system. Therefore, this section will present the three most common approaches and will briefly comment on their key features. Next the approach decided on in Trans-SEC will be described more in detail.

² In the Trans-SEC project we need to discuss with all members, which type of Food Insecurity we are talking about and find definitions.



The different innovation system approaches assume and represent different system boundaries and have different perspectives and emphases to offer. The evolution of perspectives on innovation systems in agriculture includes *NARS* (National Agricultural Research System), *AKIS* (Agricultural Knowledge and Information system) and *AIS* (Agricultural Innovation System) approach (see **Figure 2**). Those are probably the most relevant ones to mention here. There is still constant development leading to more approaches like *SOLINSA* and others which are not mentioned here, because as of today they are not relevant for this context so far.

2.1 Innovation systems Frameworks

In the early 90ies projects mostly tried to connect to **NARS**, which was mainly focusing on national research institutes as the sole producer of knowledge and innovations to the farmers. Furthermore, this approach does not make a difference between innovations and inventions. Also, it was assumed, that farmers cannot be innovative themselves (Syabola, et al., 2012). This approach was criticized for several reasons: a linear approach or for leaving important actors outside the system (e.g. the farmers themselves) (Assefa et al., 2009).

The *AKIS* concept (introduced by N. Röling in 1986) on the contrary was introduced to overcome the shortcomings of the *NARS* approach, by attributing the farmers the role of important actors in the system. According to FAO the *"Agricultural Knowledge and Information System links people and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information. The system integrates farmers, agricultural educators, researchers and extensionists to harness knowledge and information from various sources for better farming and improved livelihoods."* (The World Bank, 2000: 629). An achievement of *AKIS* is that it is not just describing systems, but several specific measures and tools aiming to facilitate agricultural innovation have evolved from the concept. Such methods are e.g. *PID* (participatory innovation development) or *RAAKS* (Rapid Appraisal of Agricultural knowledge systems) (Assefa et al., 2009; Engel, 1997). This concept is still widely used to look at agricultural innovations in developing countries and to set up activities in order to enhance innovation. The last concept is the *AIS* (Agricultural Innovation System) which originated from a developed country context and aims to explain complex innovation relationships, emphasizes the role of markets within the system and studies how innovation systems emerge and how they are coordinated on a higher system levels.



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The framework therefore has it's emphasize more on a meta-level and does not provide concrete action recommendations on a local level, whereas the AKIS provides tools for the regional and local level. Summing up, those three frameworks incorporate different actors in the system and have different definitions for what they understand by "innovation" or "system" and do therefore arrive at opposing results when giving recommendations. Nevertheless, none of the approaches can provide for a comprehensive analytical framework to structure the empirical work, as would be needed to provide the baseline description of conditions for food security innovations in the Trans-SEC setting.

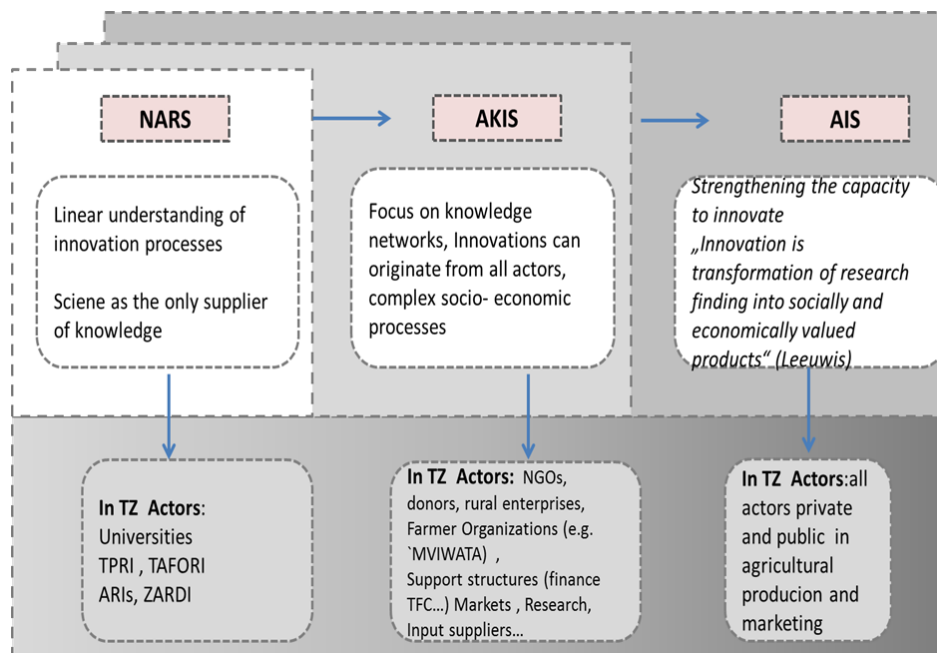


Figure 2: Different system approaches to understand and describe food and agricultural systems

Those three system approaches, do not explicitly differentiate between the government levels and do not offer a clear analytical framework. Furthermore, they don't incorporate the innovation process perspective and do rather describe the system, each from its specific viewpoint. Neither do they claim for specific empirical methods. Taking this into consideration, we choose to use an **analytical framework** that makes it possible to look at specific details of the system (e.g. a level or element, or even single innovation) but makes it also possible to look at; so to say the "environment" of an innovation (describe e.g. what are policies / factors influencing the decision for or against a specific innovations) and the process perspective, at the same time. This analytical frame is the



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Innovation System Framework by F. Malerba (2002, 2004) which was adjusted to fit the specific circumstances we can find in TZ context of Trans-SEC. Initially, this framework was developed to look at sectoral innovation systems in “developed” country contexts and might therefore not fully apply to the circumstances we can find in LDC like Tanzania, but it can serve as an analytical framework. Nevertheless, it has already been used to look at catching-up sectors (like ICT) in LICs such as India defining innovation as a way to do things differently, in accordance with Schumpeter (Malerba and Nelson, 2006 and Malerba, 2005). The main actors and backbones of sectoral innovation systems, as they are meant by Malerba and others are firms, as well as there have to be markets to sell products (Malerba, 2006). Food security innovations in contrast often have to be realized without markets or firms or private enterprises in place, quite the opposite, those innovations are characterized and realized with a great influence of government in the respective countries, with private enterprises still playing a subordinate role.

Used as an analytical frame only, it allows us to incorporate context relevant system levels and system elements (see Figure 3).

System Levels	National	Regional	Village	Farmer Group	Livelihood
Actors, Organizations	?	?	?	?	5 assets of livelihood Human capital Social Capital Physical Capital Natural Capital Financial Capital
Interaction, Intermediaries	?	?	?	?	
Knowledge Base, Human	?	?	?	?	
Institutions, Politics	?	?	?	?	
Competition	?	?	?	?	
Technology, Demand	?	?	?	?	
Limitation of natural resources					
Innovation Processes					

Figure 3: Analytical Framework to look at Food Security Innovations in Tanzania

(Own figure, adapted from Malerba (2004), Bokelmann et al. (2012))

The system elements used in the initial framework by Malerba (2002, 2004) are: (1) agents and organizations, (2) interactions and intermediaries (3) knowledge base and human capital, (4) technology and demand, (5) Institutions and politics and (6) competition. Using these elements, a



system can be described, but not explained. Additionally an element (7) Limitation of natural resources was added. In this case, the accessibility and the conditions of natural resources are a major precondition for food security and are therefore a crosscutting issue among all levels and elements. In order to explain the *HOW* and *WHY* innovations occur or are hindered over time, we have to add a **process perspective**. Therefore an additional system element called (8) innovation process is added in order to describe how innovation processes proceed over time (see Bokelmann et al., 2012). This element can reveal **linkages** between the other elements and **describes how** actors work together.

Table 1 Description of System elements from the analytical framework.

System element	Description of the element
Agents and Organizations	Characteristics of existing organizations and actors are being described. Central specifics are mentioned. Agents and organizations can contain: individuals or groups of individuals, enterprises, universities, financial institutions local authorities, training institutions or others. Agents and organizations can be on different organizational levels (sector level or case study level).
Interaction and intermediaries	Intermediaries are networks, extension services as a specific characteristic of the agricultural or food systems. Extension service organizations have to adopt to different dimensions of challenges: on the one hand they have to answer problems associated with changing social and environmental conditions, on the other hand they have to cope with new information technologies, changing structures and finally they have to assume their role as translator and negotiator between different actors. Carlsson et al. (2002) argue that the behaviors and interaction of the different components (agents and organizations, Institutions and regulatory frameworks) will influence the whole set of interaction and intermediation in a system. This means that system components are interdependent (Carlsson et al., 2002).
Knowledge base and human capital	This element includes sector specific or cross-sectoral knowledge within the innovation system. Specifics such as mobility of labor, or spread of sector-specific knowledge, learning processes and knowledge access, training and education (Malerba, 2002).
Institutions and policies	Implicit and explicit rules for interaction between the actors and/or organizations within the specific innovation system. This includes rules and standards, but as well behaviors and routines. Actors within the innovation system are mainly influenced by the legal framework, applying to the sector (specific departmental policies). Describes the impact of specific policies on single innovation processes. What incentives do actors have to be innovative? (Grants, funding etc.)
Technology and demand	Analysis of existing technologies, trends (products and services), as well as demand can give information on how the sector will develop in future and which central developments-and future potentials can be awaited for a sector.
Limitation of natural resources	The limitation of natural resources is one of the main reasons for the food insecurity in Tanzania. This is therefore taken up as a new system element by the authors.
Competition	The competitive situation in the innovation field in national and international has to be described in this analysis element. Concerning the competitiveness of the whole value chain, ea. in comparison to the same value chains in international competition.
Innovation processes	This system element was added to the analytical framework/reference framework in order to gain knowledge about innovation mechanisms. This elements adds the process perspective.



2.2 Relevant levels of analysis

The framework used foresees and suggests to include different system levels on which the innovation processes can be analyzed. Different levels can have different characteristics, actors or possibilities to address the FS problem. Those different levels of aggregation allow to include several dimensions of the system and consequently, comparing them to each other using the system elements as shown above (**Figure 3**). In our research, we have included the following levels as relevant: the first one is the **national level**, which includes major food security policies and governance. Policy is a main actor, as food security is ranked as an issue of high importance which needs national support. There is a number literature on the role of government for food security (in TZ and global). Literature is quite clear about the fact, that governance can be both: a driver and a solution for food insecurity (Candel, 2014). Food security governance, in a meaning of problem solving mechanisms can be defined as *“the interactions between public and/ or private entities ultimately aiming at the realization of collective goals.”* (Candel, 2014:2). In Tanzania, a number of national institutions address the issue of food security and the national level therefore is a relevant level to study obstacles and promoting factors to such innovations.

The **regional or district level** is another important level to look at: (a) because Trans-SEC is operating on a regional level, including two regions that have quite different characteristics in terms of culture, religion, natural conditions or climate change. Another important issue why it is useful to look at the regional level is the fact, that the regions have become powerful entities with large financial resources after the decentralization process in the 8ies. The next level, as we can see in the Figure, is the **village level**. The village is the level where Trans-SEC upgrading strategies are being implemented and a starting point for the dissemination of corresponding UPS. Trans-SEC addresses four villages in total, two in each region (Dodoma and Morogoro). Lastly, the **Farmer Group (FG)** level was included in the framework because farmer groups implement new ideas and innovations and are main disseminators for knowledge and innovation in the rural Tanzania. The **individual level** is addressed in the Trans-SEC overall household survey (HH). Task 8.2 does not do own research on the individual level, but includes results from the survey into the research on the FG level. As can be seen



in **Figure 3** on an individual level the livelihood concept has to be applied, as this concept is mainly used in practice and also well known to the farmers themselves.

2.3 The Sustainable livelihood approach at the individual level

The individual farmer is an important actor in the system and a target of Trans-SEC as it focuses on pro-poor innovations. To apply an innovation system framework to the individual level is not quite so promising. Therefore we use another concept that is well known in rural areas in Tanzania and is deeply rooted in the minds of farmers. The Sustainable Livelihood Approach (SLA) was developed in the 90s to help the people analyzing what they do at present and what they possibly could do in order to enhance their personal livelihood situation in the future (including Food Security) (Scoones, 1998). The framework does this by appointing five assets: human capital, financial capital, social capital, natural capital and physical capital (**Figure 4**). It is assumed, that shocks, trends or seasonality can influence the occurrence and composition of these five assets for the individual. Furthermore, by applying livelihood strategies (Scoones, 1998) individuals can change their livelihood outcome and their assets (e.g. more income, better food security, improved skills). It connects in so far to the innovation system framework, as it emphasizes comparable factors (e.g. knowledge, infrastructure or technology), just it does that on an individual level. It also looks at the wider context of those assets (e.g. policy or competition) (Morse et al., 2009) and can therefore be linked to the IS framework as used here as shown in **Figure 3**.

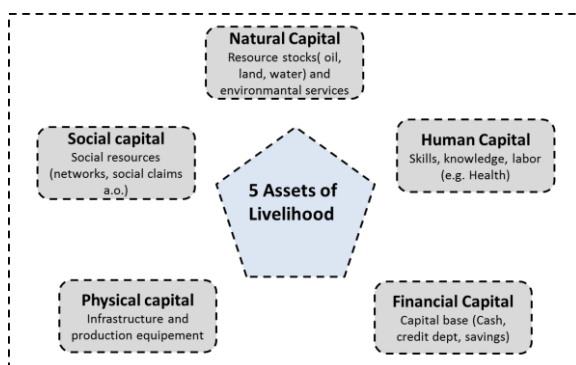


Figure 4: The five assets of livelihood (acc. to Cooke, 1998 in Scoones, 1998)

An example to connect the SLA and the IS would be if a farmer changes his financial capital by joining a farmers group that helps him to raise his income by joint projects (such as described in section 4.3 of this report). Changing his financial situation maybe allows him to also improve some of the other assets, like his human capital, thus improving his livelihood.



3. Methods

That methods are derived from theory normally is a widely accepted approach. Nevertheless, IS frameworks are methodologically “neutral”. They mainly provide for a way to structure thinking and embed the empirical work into an analytical frame, as done here. Therefore, literature states that methods still have to be developed (Assefa, 2009; Spielmann, 2009).

As not much is known on food security innovation processes in the case study sites, an explorative approach had to be used here: from what we know, valuable information on Food Security innovation processes on a local level is only very incompletely available in written form. On a national and regional level some explicit information is available, whereas on a farmer group or livelihood level again, this information is lacking. In order to be able to give a comprehensive overview of the setting in which FS innovations in the CCS occur, we need to apply an explorative approach, in order to access available and useful information on the different system levels.

The first analytical step was to provide an overview of Food Security related issues (e.g. policies, laws) on the national and so far as possible, on the regional level. This included an intensive secondary literature review of documents such as: policy papers, framework papers, national NGO activities, and so forth. In a second step, the literature review was linked to key actor interviews on a national and regional level, in order to reveal knowledge gaps and answer questions, which could not be answered during the literature review. At third, on the farmer group level group discussions with existing farmer groups (outside Trans-SEC) were conducted to understand innovation processes on the ground.

As part of the broader research framework of Trans-SEC four case study sites (CCS) villages, located in two different regions namely: Morogoro and Dodoma were already selected beforehand (Graef et al., 2014). In order to allow for comparability with the overall project, this sub-project (WP 8.2) selected farmer groups in the same CSS and same villages for field work.

Table 2: Methods used for Baseline Study on Food Security Innovation processes

Levels	National level	District / Regional level	Farmer Group Level	Livelihood Level
Activities				
Literature review	X	X	(X)	-



Semi-structured Interviews and informal talks	X (6) *	X (6) ³	Informal talks with farmers	-
Group Discussions/ Group Interviews	-	-	X (3)	-
Using results from other Trans-SEC activities	-	- (not so far)	X (DITSL)	X (HH Survey) (supportive for 8.2)

3.1 Literature review

In order to understand the activities connected to food security innovation processes and to get a better understanding of the broader setting and the conditions under which FS innovations emerge in TZ; a literature review was carried out starting from the national level. Relevant documents as scientific articles, websites, newspaper articles, policy documents etc. were analyzed in order to derive first insights. The selected texts covered the system levels national and regional /district and sometimes gave hints also on village level. But mainly, for the village and livelihood level not much written down information from an innovation research perspective was available. The result of the literature review gave preliminary hints into the constitution of system elements (as predefined in the analytical framework (see **Figure 3**), revealed research gaps and consequently served as a good indication on open questions for the expert interviews and group discussions.

3.2 Semi-structured expert interviews

Semi-structured expert interviews (Kvale, 2007) were carried out in order to answer open questions from the literature review. In this research, we defined experts to be such persons, which have relevant knowledge of the FS system or a specific system element (as indicated in **Figure 3**). Consequently, experts were selected for interview either because they were actively involved in; or supported innovation processes closely related to FS, or they could provide relevant knowledge on a policy level. Experts were also chosen, either because they were recommended as relevant

³ Nine interviews were conducted so far. Some interview partners could provide relevant information on more than one level.



interview partners by experts from the Trans-SEC consortium, or they were identified by the researcher as relevant experts because they had e.g. published documents or were named for research projects. So far, 9 in depth interviews were conducted with persons from different positions and system-levels. Interviewees were constituted from policy / Think Tanks (1), financing (1), research (3), extension (2), farmers organizations (1), NGOs (2). Each interview followed a pretested interview questionnaire and had a duration between 50 min and 1, 45 hours. During the interview, interviewees were not able to answer all topics equally, but rather concentrated on their main competences.

Six interviews could be recorded, the interviews were transcribed, and in the other cases the researcher was able to take notes during the interview. Interview data was then analyzed using the qualitative evaluation software MAXQDA (Mayring, 2010) in order to generate codes for further interpretation and analysis of the material. **Figure 5** below shows us, that most interviewees gave answers that could be coded to 1) actor and organization, 2) innovation processes and 3) interaction and intermediaries. Only three answers in total referred to questions on the element of limitation of natural resources.

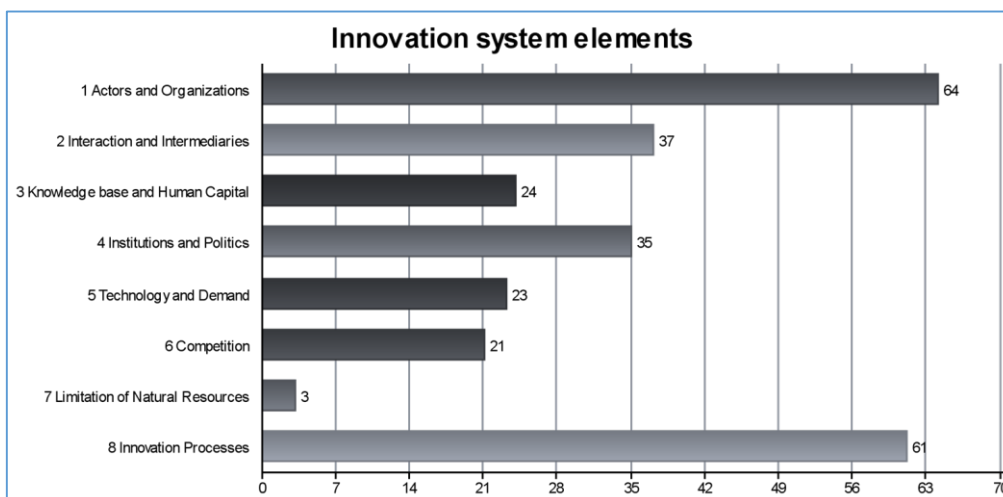


Figure 5: Answer frequencies according to the eight elements in MAXQDA

So far, one key actor interview on the national level could not be conducted as planned, because the research permit (being a general requirement to do official interviews with actors in policy), did not arrive at all, even with a preparatory phase of several months.



3.3 Group Discussions

The group discussion (GD), using **real groups** (e. g. Przyborski and Wohlrab-Sahr, 2014, Lamnek, 1998) was selected as a method to understand practices of farmer groups facing food insecurity (FAO, 2006) similar to Trans-SEC groups. The groups share two experiential spaces: one is the experience of transitory food insecurity and second is the formation of a farmer group in order to reduce negative consequences from food insecurity by engaging in innovation processes. Activities regarding food security innovations of self-initiated farmer groups have not yet been documented in written form. In this case, a group discussion can provide access to the implicit knowledge base of this social entity (e. g. Przyborski and Wohlrab-Sahr, 2014). Here, the aim of the GD was to explore group dynamics regarding **how the groups deal with FS innovation processes**. The group discussions lead to a better understanding of different aspects and dimensions (Lamnek, 1998) regarding these questions.

Literature discusses a number of general difficulties affiliated to GD in the context of “the majority world” (Jakobsen, 2012). Some relevant issues are most certainly issues of alterity, positionality and power and gender (ibid.). Whereas these are also important in a developed world context, those issues play a much more important role in the developing world. The researcher tried to anticipate negative consequences of neglecting these issues; therefore the groups were carefully selected following a set of criteria that was discussed with the project management and the group facilitator beforehand and will be explained in the next pages.

For the baseline study for general settings of FS innovation processes; initially three GD were conducted in February 2015 with three different already existing farmer groups, which are groups outside Trans-SEC. Those groups have, in contrast to the Trans-SEC groups, already started to implement new things as a group in their villages. The innovation examples chosen by the groups were: poultry keeping, sunflower processing, milling or savings and credit. Those activities are similar to Trans-SEC UPS-groups and therefore relevant to work with and to learn from their experiences. The main objective of the GD was to learn from existing groups what action practices farmers choose in order to be more food secure.

As mentioned earlier, the interviewed groups were selected by the researcher beforehand, based on the Trans-SEC draft report by A. Katunzi (2014) and the selection was discussed among the researcher and the TZ partners prior to approaching the single groups.



The criteria for group selection were:

- (1) Innovation examples give relevant input for Trans-SEC and can be compared to Trans-SEC UPS
- (2) Innovation processes have been taken place and actors can reflect on the process.
- (3) Include different kinds of innovation: crop production / institutional / market access...
- (4) No direct overlap to other Trans-SEC work packages and activities.
- (5) General conditions are similar to conditions in Trans-SEC CCS (meaning: rainfall, crops, general conditions for government funding and extension...)
- (6) Groups have been recommended by Trans-SEC partners or country experts.

Even though, criteria were met already by preselection of the group by the researcher, the MVIWATA representatives did not use the criteria for invitation of group members in the next step.

Table 3: Criteria for invitation of group members to join the GD

Criteria	Criteria met: yes/ no		
	Group I (Misani) (Morogoro)	Group II AMAN I (Dodoma)	Group III MISANI (Dodoma)
Function (all functions that are represented in the group e.g.: grower, seller, group leader...),	Yes	YES	YES
Age and gender (as representative for the group)	Yes	YES	Yes
Total number of participants <12	Yes (only 11 members in the group)	No (16)	No (21)
Socio-economic criteria (invite poorer and richer households, gender balanced)	yes	-	yes

Contact to the groups was established by MVIWATA representatives and the groups agreed to be available for group discussions. An overall dramaturgy was provided beforehand by the researcher and was then discussed face to face with the moderator/ facilitator of the group (MVIWATA). In order to make sure, that the researcher can keep track of the group interviews, which took place in Swahili and/ or Gogo language, a simultaneous translation was provided to the researcher by an external person. In the case of questions of understanding, the researcher could ask and clarify immediately with the translator/facilitator or the group. The single question categories were written down in Swahili A3 paper sheets so that everybody could follow the discussion. For their participation, farmers received 5.000 TZS each as well as a paper notebook and pencil to take notes during the discussion.



Table 4: Characteristics of interviewed Farmer Groups

Group name and #	Location of group	# of attending members (total # members)	Focus of group work	Criteria for group selection are met*	Group Demographics
Group 1 VIOKUILA Vijana ukombozi Ilakala (Youth Liberation Group of Ilakala)	Region: Morogoro . District-Kilosa, Division- Ulaya, Ward- Ulaya, Village: Ilakala	8 (11)	Original activity sunflower processing recent activity : milling of different crops, Saving & Credit	Yes	female 46% / male 54 % age of group members 18-45
Group 2 AMANI	Region: Dodoma District: Chamwino, Division: Mwumi, Village: Idifu	16 (20)	Saving & Credit, rice growing	Yes	female 90%, male 10%
Group 3 MISANI	Region: Dodoma District: Chamwino, Division: Mwumi, Village: Iliolo	21 (42)	Poultry Keeping, Saving & Credit	Yes	female 45% and male 55%

3.4 Input from other Trans-SEC methods and WPs

On the **livelihood level** there is no empirical information available from innovation literature yet. The Trans-SEC overall HH survey will provide useful information on this level, also to Task 8.2. Therefore, innovation specific questions were added to the HH survey questionnaire prior to the first round. For the second round, new questions will be added and the old ones removed from the questionnaire. Information on this level will be supported by a number of other Trans-SEC activities, such as the Focus Group Activities done in other work packages (e.g. DITSL, ZALF) as well as talks with the doctoral students working in the villages will add valuable information.

4. Results and Discussion

At first we present the results by method as mentioned in the corresponding section; results are furthermore structured along the eight system elements as presented in the framework (see **Figure 3**). Subsequently, we will very briefly merge the results from different methods comparatively.



4.1 Results from Literature

We start with the results from literature. Literature review was conducted on the national and regional level and subsequently reveals results primarily on those levels.

Actors and Organizations

In general, results from literature show that government, NGOs and other important actors are highly ambitious to target food security each by their respective activities and policies. Countless policy documents, policy briefs and implementation plans address the issue, pushing for solutions to mitigate food insecurity and its consequences particularly in rural areas. During literature review it becomes obvious that certain solutions are specifically preferred by NGOs recently including innovation platforms (IPs), Local Innovation Support Funds (LISFs) or Participatory Innovation Development (PID) (PROLINNOVA, 2012). This strong emphasis on participatory approaches originates from the AKIS thinking many NGOs have. Other approaches are more preferred by government/ ministries which want to strengthen and put more emphasis on the extension system and district research organizations like ARIs (URT, 2011) putting emphasize on a NARS understanding of the system. This part of literature is often content to withdraw to and refer to the NARS system and its boundaries and does not explicitly name the farmers as active actors to promote FS innovation processes (IP). In certain literature (e.g. Palotti, 2008 or Haug and Hella, 2013) it was put emphasize on the argument, that the rural population of Tanzania perceives the national policies, like kilimo kwanza (agriculture first) mainly as rhetoric's; having no sustainable impact and no specific solutions to offer for the smallholder subsistence farmer.

Tanzania was under change in the last decades and has undergone a decentralization process in the late 80ies, (that was also characterized by enormous budget cuts). This is reflected in today's structures of actors in charge of Food Security policies (Diyamett et al., 2012; Heemskerk, et al. 2004). This applies particularly to government research institutes, which are on the one hand side supposed to bring forward solutions and research; but face on the other hand side extreme financial restrictions. The decentralization activities also resulted in a focus on more neo-liberal politics in the 90ies before then focusing on good governance, poverty reduction and institutional reforms in the late 90ies as it was becoming clear, that economic growth has not been able to automatically improve the food security situation and alleviate poverty in the country (Palotti, 2008). Additional to



national and regional actors, a number of supranational organizations play a role in addressing general questions of food security worldwide also having an impact on SSA and Tanzania: IMF; Worldbank or IFPRI (International Food Policy Research Institute), are just a few organisations to mention here.

Public sector key actors on a national level like the Ministry Agriculture and Cooperatives (MAFC), including a division dealing with Food Security issues⁴ and government affiliated universities like SUA or the University of Dar es Salaam are focusing agricultural and food security topics. The Ministry of Agriculture, Food and Cooperatives has a strong influence on the system, but has to communicate almost all activities with the PMO (Prime Minister's Office). National think tanks like STIPRO play a supervisory role and keep contact with important actors on the regional and district level.

The main sector program for Food Security, TAFSIP, is content wise associated with the agricultural sector. Within this framework, public sector agencies should create an enabling environment for agricultural sector development, policy formulation, the legal and regulatory framework, and the management of public investments in infrastructure or facilities (URT, 2011). Thereby, it focuses different key activities (like irrigation, crop production or nutrition) and involves the corresponding ministries which are: Ministries responsible for Natural Resources and Tourism, Land and Housing Infrastructure, Finance, Energy, Labor, Gender and Children Affairs, and Health and Social Affairs (ibid.). The literature also specifies research and extension as main actors to implement the program. In the case of nutrition and food it identifies the Tanzania national Food Centre (TNFC) as an important actor for implement research development.

On a **regional / or district level**, different zonal agricultural research institutes (ARIs) and universities are located and have the task to be the main producers of knowledge to the system. They do on farm research, in their specific socio-economic or agro-ecological environments (Barham and Chitemi, 2009). Nevertheless, planning processes do mostly not involve interaction with local farmers, but are done by conventional methods without participatory processes (Barham and Chitemi, 2009) thus, they often fail to work. Also, the research is underfinanced and thus, cannot perform its duties to full extend. Literature also raises the problem that research is mainly donor driven and not demand driven (Haug and Hella, 2013).

⁴ see <http://www.kilimo.go.tz/Organization%20structure/NFS/food%20security.htm>



On a local/ village level, main actors to enhance food security innovations are farmer groups. There are different kinds of farmer groups: those that are formally registered (on the district level) and have given themselves a constitution and those, who are just informal groups. Most groups belong to the second group. Also there exists no data about the actual number of farmers organized in – whatsoever- groups. Neither is there data on the total number of groups. MVIWATA works mostly with farmer groups, but due to budgetary restrictions, they tend to work with groups which are involved in projects. Groups that are not funded often stand for themselves; most of them with bad connections to stakeholders outside the villages, which results in the fact that groups do often not achieve the group goals.

In literature, there are different opinions on the question if the **single farmer** is a key player in promoting food security innovations. Concerning research and extension the single farmers seem to have gained more influence in the last years in planning and decisions processes (Lema and Kapange, 2006) whilst other actors in the system have a contradictory perception; saying there is nothing like the “innovative farmer”. In the village, performance of village representatives (like VEOs, chiefs or other) play a role in motivating farmers to be innovative themselves. NGOs, e.g. PROLINNOVA stress the importance of farmers as knowledge producers for the promotion food security innovations (Malley, 2012).

NGOs as actors promoting FS innovations

MVIWATA established in 1993, in Morogoro is the central non-governmental - organization for farmers (FO). It stands for the interests of appr. 60.000 Tanzanian farmers and is represented and active on all system-levels from national to village (Kaburire and Ruvuga, 2006). Despite the existence of MVIWATA and other smaller FO’s the participation of farmers in decision making processes stays inadequate low (ibid.) As a central actor, it has the tasks to link farmer groups to each other and ensure their participation in decision making processes over all levels of the system (ibid.). As MVIWATA is an important actor as well as an important intermediate in the system, it will be handled more in detail under the headline of interaction and intermediates in the chapter on expert Interviews.

Other important NGOs are: PELUM; which is an umbrella organization for NGOs working on the rural level, INADES; or PROLINNOVA (which was not active in the last years but is going to be rebuild in Tanzania from 2015 on). Those NGOs do also work in other countries.



The government also attributes specific tasks to the NGOs in order to implement National programs aiming at food security. In relation to e.g. TAFSIP as the main sector program, the NGO and civil society organisations (CSOs) should take a role in poverty reduction by *“building local capacity and empowering communities to take responsibility for their own affairs. CSOs will work closely with the ministries and local authorities to ensure that cross-cutting issues are addressed in the sectoral and district development plans”* (URT, 2011).

The local SACCOS or other funding possibilities like the local innovation support funds (LISF) are major enablers of innovation activity as they provide funding to farmers to implement innovative ideas. The idea of LISF, combined with PID (Participatory Innovation development), is to include farmers in decisions on funding mechanisms to support local initiatives and ideas (PROLINNOVA, 2012). To disconnect funding from government agencies should help farmers to experiment and innovate on their own, until now the LIFS was supported by PROLINNOVA and funded e.g. by the Rockefeller Foundation and the Dutch government. Funds from *5-1670 € were used for farmers own experimentation, joint experimentation with other ARD or learning or sharing visits* (PROLINNOVA, 2012: 3).

Incorporating and developing the private sector

In the main program for Food Security TAFSIP, the **private sector** should have a central role as the engine for economic growth. The factors that hinder private sector participation in the rural economy will be addressed through business councils and forums, and business-friendly trade and investment policies (URT, 2011). This is hoped to be followed by private sector investment. The entry of new (predominantly private) actors into the system is also mentioned by Assefa et al. (2009) as an important step to overcome the still prevailing NARS structures that mainly see the research as producers of knowledge and innovation, and neglect the role of private actors and markets. Despite the structural adjustment the country has undergone during the last years, the private sector still does not play a distinct role at the local level and for the farmer (groups). This development has been reported for many other SSA countries (De Janvry and Sadoulet, 2010). This is said to be due to unfavorable investment environments. As of today, the private sector is more involved in the policy concepts located on the national scale, as TAFSIP, BRN or SAGCOT and other initiatives aiming at economic growth of the agricultural sector as the main strategy to alleviate food insecurity and poverty.



Interaction and Intermediates

Intermediaries like universities or supportive structures as extension services interact with each other and can possibly promote collective learning processes (Watkins et al., 2014) and thereby enhance innovation processes. Tanzania has as many developing countries a great variety of institutions that could act as intermediates. At the same time only few institutions have a great impact on food security innovation processes. Whilst traditional concepts of intermediate and interaction strengthen the link between university and industry (ibid., Lundvall, 2005), the case of food security innovations in TZ requires another perspective. Here the link between small scale subsistence farmers, NGOs and government affiliated institutions moves into the center. **MVIWATA** is the biggest NGO farmer organization and possibly the most important link to the farmers, operating on and interacting among all levels of the system (from national to the single farmer), supporting mainly farmer groups and representing about 60.000 Tanzanian farmers. One of MVIWATA's tasks is to be a translator between the farmers and the research. MVIWATA is the only multi-issue farmer organization in Tanzania, aiming to give farmers a possibility to participate in decisions and processes that they are affected by. Furthermore, MVIWATA is not a producer of knowledge but provider for knowledge for innovation, while R&D is done by scientific institutions (Kaburire and Ruvunga, 2006; Kelefa, 2008). Other intermediate organizations, providing also some kind of extension service are often linked to specific cash crops and their value chains e.g. coffee and are therefore not accessible for farmers growing other (food) crops (Lema and Kapange, 2006). Even though MVIWATA is a NGO and is to a certain extent working with participatory methods and including farmers in activities, they still relate and take as a point of entry the NARS approach (Lema and Kapange, 2006) when defining the actors of the agricultural innovation system. The NARS approach, as was mentioned earlier is a rather "outdated" approach that limits the system and the knowledge production to research and leaves the farmers themselves out of the system or innovation thinking. As MVIWATA seeks to support farmers and farmer groups it could also refer to the AKIS concepts which are more inclusive in this regard.

Farmer groups are important for **interaction** between farmers (Barham and Chitemi, 2009) and a major distributor of knowledge. Nevertheless, interaction among farmer groups is still an exception. Also Agrawal (2001) defines different factors that would make it easier for FG to interact (by collective action) and thereby increase the likelihood of a better market integration. Those factors



are: strong leadership, small group size, shared norms and values or interdependence of group members as well as low levels of poverty and more ties to organizations within and outside their community (Barham and Chitemi, 2009; for full list of indicators see Agrawal, 2001: 1654). Some of these preconditions for successful interaction are not yet given in the case of Tanzanian FG which do specifically lack strong ties to other organization or outside communities. This will be further elaborated on in the section for expert interviews and FGD. Literature adds to this point in so far, as it points out that financial resources are lacking to promote such activities and interaction among farmers. MVIWATA has the task to link different FG, but is restricted in resources both financially and human resources as well as knowledge.

The **agricultural extension system**, as an important intermediate in the system and a link to the farmers is on one hand side still mainly provided by the government, which on the other hand side has withdrawn financial support for this system to work properly (Temu et al., undated). More responsibility has been handed over to the regional and district levels in the late 90s. Whether small-scale farmers receive extension or not, also depends on the district they live in. Peasants in Arusha tend to be covered better than in Dodoma (ibid.). Nevertheless there seems to be a mismatch between the coverage rate mentioned in literature and the statements from expert interviews and FGD indicating a lower coverage of services than mentioned in certain literatures. Local village extension officers often have no chance to visit single farmers and improve interaction among them. Interactions among levels will be explained more specifically in the expert interview section.

As a solution to such problems, on a national and regional level, **Innovation platforms** have been established as to act as intermediates, which are often mentioned in recent literature and are a means to enhance multi-stakeholder learning and interests (Spielmann et al., 2009). Also in TZ they are funded and put up by many organizations recently as promising tools to coordinate innovation activities. Also, literature critiques that innovation platforms are very well in niches, working for this purpose, but the effectiveness is not sufficiently assessed in practice (Hounkonnou et al., 2012). Furthermore, innovation platforms for pro-poor purposes are not common. They mostly work on a district level addressing specific innovations (e.g. mechanization, seed). The target group here is not the poor subsistence farmers. Even on a district level, the innovation platforms need a clear mandate in order to fulfill their tasks. A problem is that platforms members mostly do not represent all steps of a value chain, which would be necessary to fulfill all functions of those platforms (Nederlof et al.,



2011). Concerning to literature such functions are: brokerage, facilitation, mobilization, mediation, advocacy, facilitation, technical backstopping or championing (ibid.). Innovation platforms that are located on a national level do often not involve farmers and are more used as think-tanks (Nederlof et al., 2011).

A medium for interaction is the **farmers` radio** that announces e.g. prices for crops on a daily basis. Farm gate prices for crops are very low, farmers` radio help to improve the situation and help farmers to demand better prices from middlemen and other intermediate structures, which they cannot bypass because they belong to the system and are firmly integrated in the structures. Studies revealed that radio is still used more often for information sharing and reaches more farmers than other media like the internet, TV or telephone (Mwalukasa, 2012). In order to enhance innovation and to enable communication between stakeholders the so called “nani- nani”, which are agricultural fairs, take place in five Tanzanian regions every year.

On the supranational level, the farmers Voice project (also supported by MVIWATA) is also one attempt to foster the interaction between farmers and engage civil society in the problem of poverty alleviation and food security (The Guardian Tanzania, 2015).

Knowledge base and human capital

Compared to the relevance knowledge and the knowledge economy is given in literature (see e. g. Krone et al., 2014 or Eidt et al., 2012, Djeflat, 2010), and adding the associated expectations, the situation on the ground for small scale subsistence farmers in Tanzania still needs to be improved. The literature on the African transformation stresses the knowledge economy as a focal point. *“Knowledge is the most important resource and learning the most important process”* (Lundvall, 1992). Yet, literature still asks the questions of “who” should take the responsibility to make e.g. farmers more open towards innovation and science (Muchie and Baskaran, 2012: 46). Linear models, including the NARS perspective that is still applied by many actors in TZ still see research as the most important source for knowledge creation, and neglect the importance of farmers as innovators, always trying out things and developing solutions that will satisfy their needs (Röling, 2009). But activities of trial and error, thus learning are the foundation to farmers` decision making on a local level in many sectors e.g. agriculture or health (Mwantimwa, 2008). Lundvall, et al. (2003) highlight the importance of *learning* as a major characteristic of innovation processes. The authors mention



the different types of knowledge focusing the distinction between *know-how* (action knowledge, implicit knowledge) and *know-why* (expert knowledge and explicit knowledge) and extend the concept by *know-who* (access to knowledge and capabilities of others) and *know-what* (access to information) (ibid.: 6). This is also introduced in **Figure 7** of this report mirroring the knowledge flows between the different levels of the system for the dimensions of know-how and know-why.

Given the traditional (NARS) understanding in TZ, the extension services should be the direct knowledge providers for the farmers and the main producers of knowledge are public research institutes like Agricultural Universities (e.g. SUA), the agricultural research institutes (ARIs) or Departments of Research and Training (DRT). Funding for this research is mainly allocated on the district / regional level and does often not trickle down to the local level. Funding for those institutions also partially comes from other sources such as FDIs. The problem here is that in this situations research tends to be more donor driven and then demand driven (e.g. Haug and Hella, 2013). But as we have seen earlier in the chapter on interaction and intermediates, extension services are not able to cope with the demand on the local level due to several reasons. But introduction of new agricultural practices and technologies at the farmers' level requires a set of information which farmers would need in order to take informed decisions. In this regard, Benard et al. (2014) examined the main information needs of Tanzanian rice farmers. Their study showed that farmers are interested in multiple fields ranging from credit loans, to pest management or weather conditions. On the other hand, most farmers assess their knowledge to be sufficient in everyday activities such as soil preparation, crop fertilization or irrigation (ibid.). These needs are also confirmed by interviews and group discussions in chapters 4.2 and 4.3.

Literature highlights, that a number of different actors have a growing demand for in depth knowledge (Lema and Kapange, 2006). The aspect of access to knowledge (know-what) on farm level is an important aspect in many text, and results show to be consistent with results from research in WP 8.2 (Lwogo, 2011; PELUM Uganda, 2010; Benard et al., 2014): effectiveness and accessibility of different knowledge sources that supply useful information on which farmers can build informed decisions and possibilities for dissemination are not equally distributed in the regions of Tanzania: e.g. is the use of ICT dependent on literacy of users (Mwalukasa, 2013) and farmers in rural areas most likely have no access to written down information from e.g. newspapers. According to literature, the main challenge for farmers to access information is (missing) infrastructure followed



by a general lack of available information sources for different topics (Mwalukasa, 2013). Consequently, the knowledge is often just “transferred” by the extension service providers, since extension workers and researchers are often not trained in participatory methods and more conventional methods are used. Those mechanisms do not integrate local knowledge bases. Besides this practices used to share and transfer knowledge, farmers prefer demonstration as the most appropriate method to learn about new techniques or production methods (Mwalukasa, 2013) or farmer field schools.

Furthermore, it is in the tradition of the farmers, that knowledge is shared rather by discussion, than by written information (Mwalukasa, 2013), even though literacy is much higher now, this tradition is still kept up. Discussion and knowledge exchange between farmers works in an informal way (ibid.). Accessible knowledge in form of written down knowledge and information such as in regional libraries can just be found in urban areas and therefore mainly exclude farmers from this source of information. More recent literature also highlights the growing importance of ICT to access e.g. price information and the like (e.g. Krone et al., 2014).

A main obstacle to the *sharing* of knowledge amongst levels and actors, as well as integration of knowledge on a local level is often “packaging” of information (Eidt et al., 2012). The knowledge that is “produced” in research is often not translated in a way that it can be used and integrated on farm level, but the knowledge needs to be translated into skills and technologies (Sanginga et al. 2009, Leuwis, 2004). Despite this is well known and understood by experts, national level policies seldom focus the problems coming along with knowledge and information dissemination. Also sectoral policy denies the importance of local knowledge systems and experiences, resulting in the fact that they seldom expand into policy or are considered in order to shape laws (Liwenga, 2003). The idea that indigenous knowledge, used to improve technology or practices by value adding through farmers experiences is yet not exercised in everyday politics. Specifically, for the case of FS innovations, indigenous knowledge has to be stressed as very important to find and develop solutions. Indigenous

Politics and Institutions

Food Security is defined as a wicked problem, going far beyond the responsibilities and possibilities of the agricultural sector. Parts of these problems have to be solved outside the food sector or even



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outside the nation state on a supranational level. An example for an African approach to address problems of resource management, hunger and food security is the International Centre for development oriented research in Agriculture (ICRA) aiming to enhance innovation capacities in rural areas of Uganda, Kenya and South Africa (Sanginga et al., 2009). Another institution to mention here would also be IFPRI. Within Trans-SEC WP 8.2 has dealt with; and looked at the agricultural side of this issue, focusing agricultural and development policies inside Tanzania. There are a lot of strategies, plans and policy papers in Tanzania that address the issue of food security, involve different ministries and government bodies, as well as NGOs in search for solutions to this problem. Agricultural and food security programs have been a key focus for Tanzanian governments for several decades, always aiming to improve the performance of the agricultural sector and transforming agriculture from subsistence to commercial, as agriculture is a key sector for the countries' economic development – in the past, but also in the future. The aim of all of these projects was to increase the growth of agricultural sector somewhere in the range between 5 and 7 % (depending on the program, ASDP, TAFSIP, or others). The objectives of agricultural and food security programs are based on the notion that the Tanzanian agriculture needs to develop further in order to delaminate its most severe obstacles such as: low use of fertilizers and improved seeds, low use of technology and low mechanization and /or irrigation, limited access to finance, and limitation of natural resources like rainfall, and droughts (Temu et al., undated). Despite all efforts, literature further argues that the impact of many measures (national or private, research or foreign direct investments (FDI) undertaken to alleviate FS problems, is still unknown (Matunga, 2008). Hounkonnou et al. (2012) argue in this respect, that many policies used in other countries, like TSP (Technology supply push) do not work very well in SSA and show no impact regarding increased food security. There is an ongoing discussion among expert communities what the drivers of food insecurity are and on what level they have to be presumed: either within the national borders or if they have moved- along with globalization- to supranational levels. In TZ on a national level, different actors are being discussed to be influential, to have a potential impact on the problem. The overall problem mentioned in literature are unpredictable and frequent shifts in agricultural policy (Haug and Hella, 2013) which has led to a loss in confidence of farmers in government and also local authorities, resulting in weak institutions.



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Tanzanian previous programs and initiatives are for example the Arusha Declaration 1967, the Iringa Declaration of 1974 (Politics is Agriculture), *Chakula ni Uhai* (Food is life) or *Ukulima wa Kisasa* (Modern agriculture) (Coulson, 2010).

The common program until 2020 for the mainland and Zanzibar, bringing together all actors (ministries, private, community or NGO) involved in FS issues is called **TAFSIP** (Tanzania Agriculture and Food Security Investment Plan). According to literature, TAFSIP was drafted by national and international bodies, including also civil society as well as stakeholders from private sector (URT, 2011). Key issues mentioned in TAFSIP to be addressed are amongst others: irrigation, land use management, sustainable water resources, use of modern agricultural technologies or labor productivity or crop losses. The program aims to reduce poverty and alleviate food insecurity by a growth of the agricultural sector by 6 % (ibid.). High investments are tools to achieve these aims, also including the private sector more, than it was the case before.

ASDP, the agricultural sector development program is a policy tool addressing Food Security issues. As many of the programs, that stress that Tanzania's weakness is the incapability to produce enough food to feed the country, the main aims of the program are increasing productivity and profitability of the agricultural sector as Tanzania's economic backbone. The recognition, that the private sector could play a bigger role and take more responsibilities in agriculture, is taken into account: promotion of the private sector and contracting and partnerships are contents of ASDP. The program is formulated by the agricultural led ministries: fisheries, agriculture, trade and marketing, water and irrigation, the PMO as well as local governments (IMF, 2011 and ASDP Mainframe, 2003). ASDP has partner programs supporting the implementation of the initiative in the respective key areas: e.g.: policy and regulatory frameworks: World Bank, EU or DANIDA.

Kilimo kwanza (agriculture first) is a ten pillar program focusing to strengthen Tanzania's agricultural sector. The main objectives: modernization and transformation of agriculture (transform smallholder farmers to commercial farmers), increase government budget for agriculture (including the establishment of a Tanzanian Agricultural development bank), empowerment of farmers cooperatives and SACCOS, institutional reorganizations for kilimo kwanza, identification of priority areas for food productions, amend acts (village Land Act No. 5), removing market barriers, industrialization, build mechanisms for effective utilization of science, technology and human capital, as well as infrastructure developments and integration of kilimo kwanza in the government activities



(assign responsibilities). When looking at the policy papers describing the single policies all have in common, that they want to modernize and strengthen agriculture by implementing better technologies, seeds, or reach a higher degree of mechanization.

Other programs to mention here would be MKUKUTA I and II (Strategy for Growth and Reduction of Poverty I and II) as well as Tanzania development vision 2025 or the development plans on the district levels, District Agricultural Development Plans short: DADP.

The programs with great private investment are SAGCOT (Southern Agricultural growth Corridor of Tanzania) and Big Results Now (BRN). The **SAGCOT** is also used to implement the kilimo kwanza program and is a new private led approach to foster agricultural development, by improving value chains, infrastructure investments. SAGCOT was initiated at the World Economic Forum (WEF) in Africa in 2010 with the support of founding partners including farmers, agri-business, the Government of Tanzania and companies from across the private sector. It is also said to improve small scale farmer promotion but SAGCOT has also been criticized for land irresponsible investments by government and private actors in TZ it is also reported of pollution of grounds water due to the use of fertilizers and pesticides in the SAGCOT area. (<http://www.oaklandinstitute.org/irresponsible-investment>). **BRN** is focused on eight pillars including e.g. education, energy, agriculture or transport and is supported by a range of foreign donors and supporters. The idea of BRN is taken from the Malaysian example and also supported by Malaysian policy makers (<http://www.worldbank.org/en/news/feature/2014/07/10/how-tanzania-plans-to-achieve-big-reforms-now-in-education>).

On a local level the **Saving and Credit Cooperatives** (SACCOS) are introduced to enable farmers to also have access to financial resources that they normally have no; or only very limited access too (Pipek, 2007; Haug and Hella, 2013). Creating a legal framework for cooperatives privately owned and equity based, the Cooperatives Societies Act was introduced in 1991 (Pipek, 2007 and Magali, 2014), following the liberalization of financial markets (Magali, 2014). SACCOS are a help to local farmers, there were 5346 SACCOS with 970.665 members in 2013 in Tanzania (Magali, 2014). The Ministry for Agriculture, Food Security and Cooperatives is responsible for legal registration of the SACCOS and the cooperatives audit and supervision cooperation is responsible for external auditing of all SACCOS (Magali, 2014).



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Summing up, when looking at the policies aiming at food security and poverty alleviation it can be noticed, that government policies mainly address the national or district/national level. The farmer level or more precisely: measures at farmer or local level are not communicated explicitly. In contrast, do Barham and Chitemi (2009) point at the important role of smallholder farmers to reach global aims of food security. They argument, that policies should address this level also not only by production related programs and measures, but by market related programs to give them [farmers] the opportunity to participate in markets in order to increase income in rural societies, is stressed.

As can be seen in the three examples given above on different programs targeting FS, there is a lot of overlap and duplication. Several ministries take similar measures, and also competing for money at the same time. Haug and Hella (2013) argue that this makes institutions weak in the implementation of their policies; this was also mentioned during interviews see chapter 4.2. Also, within Trans-SEC WP7 elaborates more in detail on the state of institutions and policies and additional information can be found there.

Technology and Demand

Even though, agriculture contributes to the TZ GDP by almost 30 %, technologies used are still very basic. For several decades governments wish to increase mechanization in agricultural practice, and most policies related to agriculture and food security list mechanization and modernization of techniques, processes and machinery as a major focus (see ASDP, kilimo kwanza etc.). But when it comes to provision of services, which also have an impact on the possibility of small scale farmers to improve their livelihoods, like transportation or electricity, there is a great bias of coverage of service favoring the urban areas a lot more than the rural (Temu et al., undated). Furthermore, agricultural inputs and cash crops are more often supported than food crops, combined with a poor use of technology and poor coverage of services (e.g. extension) in the rural areas with predominantly smallholder and subsistence farmers. The lack of infrastructural services such as roads (Tanzania has only four major road networks going south – north, east west, Lake district and only one railway line) or warehouse systems to storage the harvest from season to season (Haug and Hella, 2013) results in high transaction, information or searching costs for the small scale farmers. It also increases the risk for small scale farmers to not be able to sell their commodities on local markets e.g. in times of overproduction on the one hand side (for example for rice or poultry) and lack of information e.g. on



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prices in times of underproduction. In order to address this problem SUA is developing a mobile based ICT system for farmers, where they can inform themselves and register e.g. as sellers of certain commodities and get into contact with buyers or middlemen.

In reality, on a local level farmers still use very basic tools, like hand hoes for tillage; as tractors or other technical aids (like irrigation systems) are often not available and/or too expensive for rent. In the Trans-SEC CSS villages, there are specific machineries for e.g. milling machines, which are often used collectively. As of today, there is no water access and electricity provision in the Trans-SEC CSS. Besides financial restrictions hampering technology use of small scale farmers; bad performance of earlier attempts to use technology hinders investment in technology nowadays (Temu et al., undated). To use technology successfully, a number of preconditions need to be set like infrastructure, extension, market information or intelligence. Temu et al. (undated) mention this with regard of irrigation use in Tanzania. Also due to mislead policies and mal-performance in the past the size of irrigated land in Tanzania is only 10%, which is less than in most other SSA countries.

Public expenditures and investment: 15% of people in TZ are connected to the electricity grid in the beginning of the 21th century and the network is limited to the urban areas very much (Temu et al, undated). The same applies to water supply, again biased against rural areas. Foreign investment focused strongly on building a water supply network until the mid-90ies and then water was free of charge, which has changed in recent years. Furthermore, the restrictions in budget resulted in fact that many taps are not working anymore today and cannot be replaced by new ones. The same applies also to all other areas where public investment would be normal like e.g. the health or education system.

The use of **Agricultural Inputs** like fertilizers and improved seeds has declined since the 1980ies. Earlier in the 80ies more subsidies were assigned to support the remote areas and specifically the southern parts of TZ profited from this practice (ibid.). Ever since, this practice has changed and priority regions have been announced where subsidies are used more than in other regions. Priority regions are mostly the western highlands or the region around Arusha, climatic favored regions that in times of drought in other regions could possibly feed the country. In areas, where no cash crops are produced inputs of improved seeds and pesticides are extremely low today. In all, 27 % of the TZ farmers use improved seeds and 70% of those go to cash crops such as cotton and coffee (Temu et al., undated). Only 18 % of the farmers use pesticides (ibid.).



Haug and Hella (2013) also point to the need to increase food storage capacities. Until now, only maize is stored in government owned storages. Storages for other crops would be needed and would lessen the need for the farmers to sell their harvest immediately. Instead they could store it and wait for better prices.

Competition

In the case of food security in TZ there is not much said in the national and regional literature on the issue of competition. Agriculture is the backbone of the Tanzanian economy, also relying on exports of crops (e. g. rice, coffee or tea). But reliability of amounts to exports is unpredictable, because of constantly recurring export bans (Haug and Hella, 2013) which the government can impose in the case of food insecurity in the country. At the same time it does not mean, that commodities are automatically relocated to the food insecure regions. Due to insufficient transportation networks, this is not possible. Tanzania has not fully transformed into a market economy (Haug and Hella, 2013), also lacking a reliable private sector in some value chains.

On a *local level* farmers are competing with each other to sell their surplus products at the farm gate. In times of overproduction farm gate prices can be very low. Most small scale farmers in SSA are not part of agricultural value chains and disconnected from functioning markets (Jama et al., 2011). Additionally, farmers are not able to produce for commercial markets as they cannot keep the quality to meet the standards and cannot provide for a continuous supply of products. The farmers are limited in terms of money; despite the existence of knowledge, implementation of ideas is often not possible due to financial constraints of farmers.

Limitation of natural resources

On a global level, food security, innovation systems and sustainable resource management, climate change or water management are tightly connected. An unmanageable number of publications address these connections. On a local scale in Tanzania, the contribution of literature on the issue of natural resources in connection to IS frameworks is not very explicit in the literature. As well it does not turn up in the socio-economic programs that focus food security. In short: there is only little recognition in literature on the contribution of the natural resources base and its impacts on FS and rural livelihoods in TZ and how this can be dealt with from an innovation systems perspective.



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Limitation of natural resources in relation to food security in Tanzania is mentioned, but is never specified more in detail in the available socio-economic literature. Also, earlier poverty reduction policy programs (e.g. PRSP) mention the environmental and natural resource base only on the edge. Different policy papers and programs (such as kilimo kwanza) address the topic by mentioning unpredictable rainfall or droughts as a major obstacle to agricultural development in TZ (MAFSC, 2012) and a driving factor for food insecurity. According to the WFP (2007) drought is most likely the cause for food insecurity in rural Tanzania, as 45 % of the population have witnessed droughts in a way that directly affected their food security situation. Literature therefore suggest as a possible solution to the problem to install drought response systems (WFP, 2007). Other problems mentioned by farmers were pest outbreaks, deforestation and degradation of soils (ibid.) Jama et al. (2011) look at soil fertility and water management in connection to food security innovations, but do not anchor/ their arguments in an innovation system framework. They argue, that soil fertility in Africa is very low compared to other continents and fertilizers used to cost 2-3 more in Africa than on international markets, which made them often not financially attractive; given the low price for agricultural products. Africa still accounts for only 1% of fertilizer use worldwide (ibid.). This makes African soils unproductive and may lead to undersupply with food crops. Winrock International (2006) therefore also points to the point that the forest policy tend to link up the role of forest to poverty and food security.

More details for the Trans-SEC CSS on this can probably be added by the natural science work packages in Trans-SEC.

Innovation Processes

The reviewed literature does not explicitly mention the importance of local mechanisms and dynamics of FS innovation processes. Nevertheless, literature draws attention to the point, that innovation and innovation processes on a local level is often used and meant in the sense of Rogers (2003) (Waters-Bayer et al., 2009). This refers also to the dissemination and diffusion of knowledge. In some literature, *diffusion* means spontaneous and unplanned spreading of innovations and *dissemination* refers to a directed and planned process of spreading. Rogers does not distinguish the two terms and uses them equally (Rogers, 2003). Focusing more on diffusion and adoption of new technologies or services combined with local knowledge. They suggest recognizing the role of



farmers as innovators, experimenting and learning from each other in their local knowledge systems, when talking about innovation processes in the context of developing countries (ibid.). This strengthens the demand to enhance local innovation processes in a participatory way, as done in Trans-SEC (Graef et al., 2014). This system element will therefore be handled in the sections for expert interviews and FGD more in detail.

4.2 Results from Expert Interviews

Interviews were conducted as described in the methods section with ten experts from Tanzania and results from the expert interviews are displayed here following the structure of the analytical framework as done for the section results from literature. Adding an introductory question to the definition of food security and get an assessment of the experts' on this topic.

What do you understand by Food Security?

The project defines food security as follows: “when all people at all times have access to sufficient, save, nutritious food to maintain a healthy and active life” (USAID, 2013). In order to determine whether this definition is appropriate in TZ the experts interviewed were asked what indicators determine whether someone is food secure and what aspects – in their opinion- a good definition would incorporate? Four of nine interviewees had something to add to the definition as I presented it to them. For them, the most important indicators are aspects of food availability and food accessibility. Food security means having enough quality food at all times, which has to be accessible for everybody, but especially to smallholders. The emphasis is on smallholder farmers, because they have been denied and have little opportunity to access enough quality food throughout the year (Interview #1). A next step would be to also stress the aspects of nutrition. Having nutritious food equals having access to balanced food (Interview #2 and #3). Cultural acceptability of food; meaning food that does not interfere with peoples eating and cooking habits (Interview #3) is also important. Here we can find cross reference to other Trans-SEC UPS like nutrition and kitchen gardens.

Actors and Organizations

“... but there in the workshops and seminars there is no farmer there.

Farmers are being left to themselves.” (Interview #6)

Taking this quote, the reader can already guess, that farmers are seldom mentioned as key actors to enhance food security innovation processes. This tendency has already been shown in the literature



section as mentioned above. In the interviews, the interviewees mention the importance of national actors like the extension services (both as an actor and intermediate), at the same time stressing the fact that those structures did hardly ever live up to their expectations, due to budget restrictions and other shortcomings. Subsequently, NGOs are mentioned to be relevant actors that “*fill the gap*” (Interview #2), where government initiatives do not work sufficiently and cannot provide sufficient services to the farmers. According to several interview partners, NGOs are closer to rural communities, and act more effectively in matters of implementation.

According to the interviewees, the ARIs are supposed to be the knowledge producers for food security innovations in the different zones (Interview #1). Other important actors are universities. In case of food security the major problem is, that research is donor driven meaning it is: “*controlled externally*” and not demand driven (Interview #2).

In terms of stocking food supplies at the national level, the national food reserve agency (NFRA) is supposed to play a major role. The task of this actor is to relocate food in times of deficit, but the food reserve agency does not have enough storage capacity so they can only store a small amount of food. Warehouses are not provided in every region due to budgetary issues, making logistics a great challenge. The national warehouses only stock maize. This is justified by the reason, that maize is very easy to stock. Interviewees also highlighted in this regard, that the government doesn’t have enough money to buy all the maize from the farmers in times of surplus, therefore farmers are more and more reluctant to sell to the government. A lot of them do even change to other crops, as maize is not paying off anymore (Interviews #5, 2).

Interaction and Intermediaries

Interviewees stressed that the concept of innovation platforms is very well known among experts and a lot of money is put into setting up of such IPs. Yet, the effectiveness of those (innovation) platforms is not yet clearly assessed (Interview #1) and “*job descriptions*” are not clear. It is very likely, that no farmers are involved in IP and stakeholders to join such platforms are not carefully selected making the outcome of the platform uncertain (Interview #1).

When focusing on the Trans-SEC target level - the smallholder farmers - the most important intermediaries are at first the extension officers in the villages and at second probably the NGO’s which are operating in the villages for a specific time. The extension service is provided by the



government and is free of charge for the farmers. It was clarified during the interviews that the extensionist should be translators and should bridge the gap between the scientists and the farmers. **Figure 6** displays how interviewees and farmers perceive the current situation of the extension service, as provided by the government today.

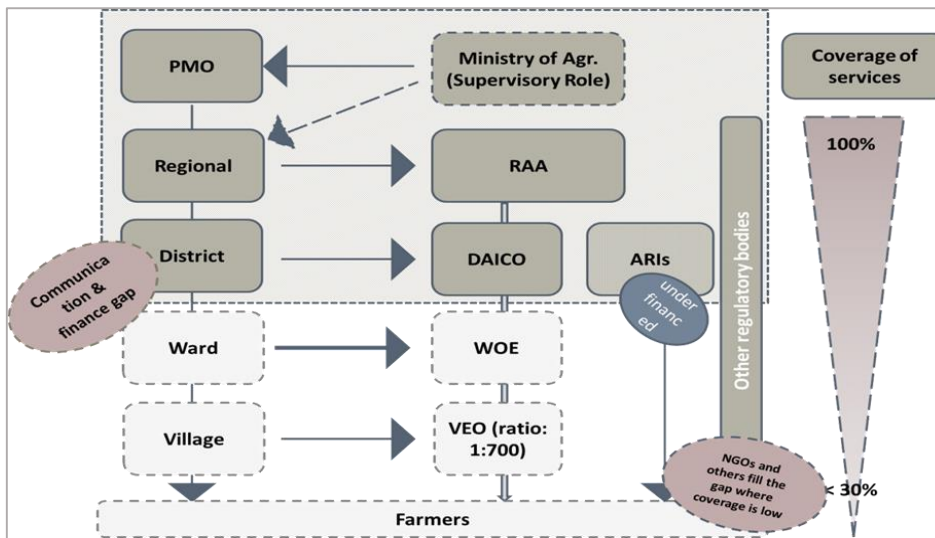


Figure 6: Public extension service as described by interview partners (own figure)

The situation of the extension, as it is perceived by the farmers and the experts has an impact on other system elements such as innovation processes or knowledge base and human capital, as we will see later. The extension system as it is in place is a government structure and organized under the Prime Minister's Office (PMO) and here the Ministry plays a supervisory role only (Interview #2). After the decentralization processes, that were mentioned earlier, the district level gained importance in setting the pace in agricultural topics. Also, even if the working situation for village extension officers has improved in the last years, they are often badly paid, and sometimes come from other sectors, and are not properly educated in agriculture (MVIWATA, verbal information). [...extension officers] *"are there to implement decisions made from district councils and those coming from the ministry of agriculture. (...) make sure, they are in line with all those objectives plus other duties as may be assigned by the district council"* (Interview #5).

Therefore, also most effort in terms of financial support for extension is done on the district level. The experts uttered that there is a communication and finance gap leading to the problem that extensions officers are limited in their possibility to fulfill their role properly. While on the higher



levels, financing is provided, the coverage of services decreases from level to level, due to budgetary limitations. The result is that funding and human resources are missing at the target level – the farmers-. There, coverage of services can be estimated to be one third of the actual demand. This resulted in a farmer extension officer ratio of 1:700 (# 2). Literature even estimates the ratio to be up to 1:1400.

As funding is the cause of the problem, it was mentioned that **communication between the levels** is hampered as a consequence of restricted funding in the system. This is in contrast to the “*traditional understanding*”, that extension is responsible to kick-start innovation on the farm level (Interview # 5). As participatory methods start to play a bigger role now, VEO are theoretically supposed to feedback information from the farmer to the research institutions. One of the interviewees stated that: “*in reality, there is no link*” (Interview #2).

Interaction among farmers is the most important type of interaction when it comes to dissemination of innovation / new practices and other. Mostly this kind of interaction happens in the farmer groups, those groups serve exclusively the interest of its members. As of today, there is no data about the actual number of farmer groups (informal and formal) in the country, there is no interaction mechanisms whatsoever, that could link up those groups, thematically or by any other indicator. Assistance offered by authorities, is often not accepted by the farmers, because many government authorities and programs are perceived as unsustainable and not trustful (Lema and Kapange, 2006, and Group discussion Group #1). That is why interaction happens along levels of trust and those trusted relationships are within the family or among friends. Meaning, that information spread mainly horizontal (Interview #5 and #2).

Knowledge base and human capital

The results from interviews show that the main source of knowledge (concerning food security innovations) are: family and friends, fellow farmers, farmers radio followed by agricultural extension officers; because interaction on a local level happens along levels of trust. So does knowledge access and diffusion. It works almost exclusively between family members, fellow farmers or friends. Nevertheless, the knowledge base is not increased significantly and fast by this practice because farmers are not professionally trained to be farmers (Interview #3), also this practice does not include explicit knowledge coming from other sources of knowledge. If the acquired knowledge is also



integrated in daily agricultural practices on the farm level is again depending if there is a relationship of trust between the potential user of such information (farmer) and the source of the information. In the case of the village extension officers (VEO)⁵ the practice is more to “transfer” and “implement” knowledge that is being produced by research institutions; this is a service offered by the government, as was mentioned before. That farmers often have limited confidence towards VEO has implications for the adoption rate of new practices and technologies offered by VEOs. That VEO cannot live up to the expectations is partially rooted in the (mal-)functioning of the system. The ratio of extension officer to farmer is at least 1:700 (Interview # 2); some literature even estimates it to be much higher in some remote areas. Furthermore, farmers from sub-villages are normally excluded from these services and have no access to this source of information, because VEO often are immobile having no bike or motorbike (verbal information extension officer, 2015). Resulting from this high ratio of extension officer to farmers, individual visits are not taking place. Instead of doing individual visits, VEOs now rather train farmer groups, which then disseminate the information to the farmers in their neighborhoods in farmer-to-farmer extension (verbal information, MVIWATA staff, 2015 and Interview #3): *“[The extension officers] have to relate more on farmer to farmer kind of interaction, because it has shown that this works best. [A] farmer can convince another farmer to adopt, more than the extension worker can. So a lot of extension people do it”*(Interview #3). Farmers are sometimes asked to participate in national boards or committees, but their advice is almost never considered (Interview #5). One interviewee highlighted that there is a high number of regulatory bodies, which are located at the universities, in ministries or districts. One example is TOSCI, which is the official Tanzanian Official Seed Certification, situated at SUA. This body has the task to inform about and ensure the quality of crop seeds from imports as well as seeds that are produced in the country. According to the interviewees, those institutions have the task to regulate the quality of information and knowledge distributed in the country. But, they are often unstaffed, and therefore very ineffective in their work (Interview #2).

The interviewees stated, that the desired links aiming at knowledge transfer and exchange between levels / institutions and actors does not work quite as frictionless as wished. This can partly be justified with the fact, that different levels produce and use different kinds as information and

⁵ Sometimes, the village extension officers are also called Agricultural Extension Officers. In this contribution anyhow, we just use the term VEO to be consistent.



knowledge: on a national /district/ regional level a lot of explicit knowledge is available. On the local level, there is implicit knowledge. This is illustrated in the figure below. The figure **Figure 7** shows that knowledge is produced on two separated “spheres” or levels of knowledge. According to the interviews, the knowledge flows are mainly from higher to lower levels. Upturned knowledge flow is interrupted between the local and regional level. This mainly indicates, what was stated very clearly by an expert: [...] so, what is known to farmers stays with the farmers it never goes up [...] (Interview #1).

As can be seen in the Figure below, on a national and regional level there is explicit knowledge available. Explicit knowledge cannot be used to learn, as implicit knowledge has to be involved in this process. Implicit knowledge (know-how or also often referred to as action knowledge), on the other hand side is available on a local level. Learning requires making implicit knowledge explicit and by recombination of information which then is called a learning process. This learning does not take place under the given situation.

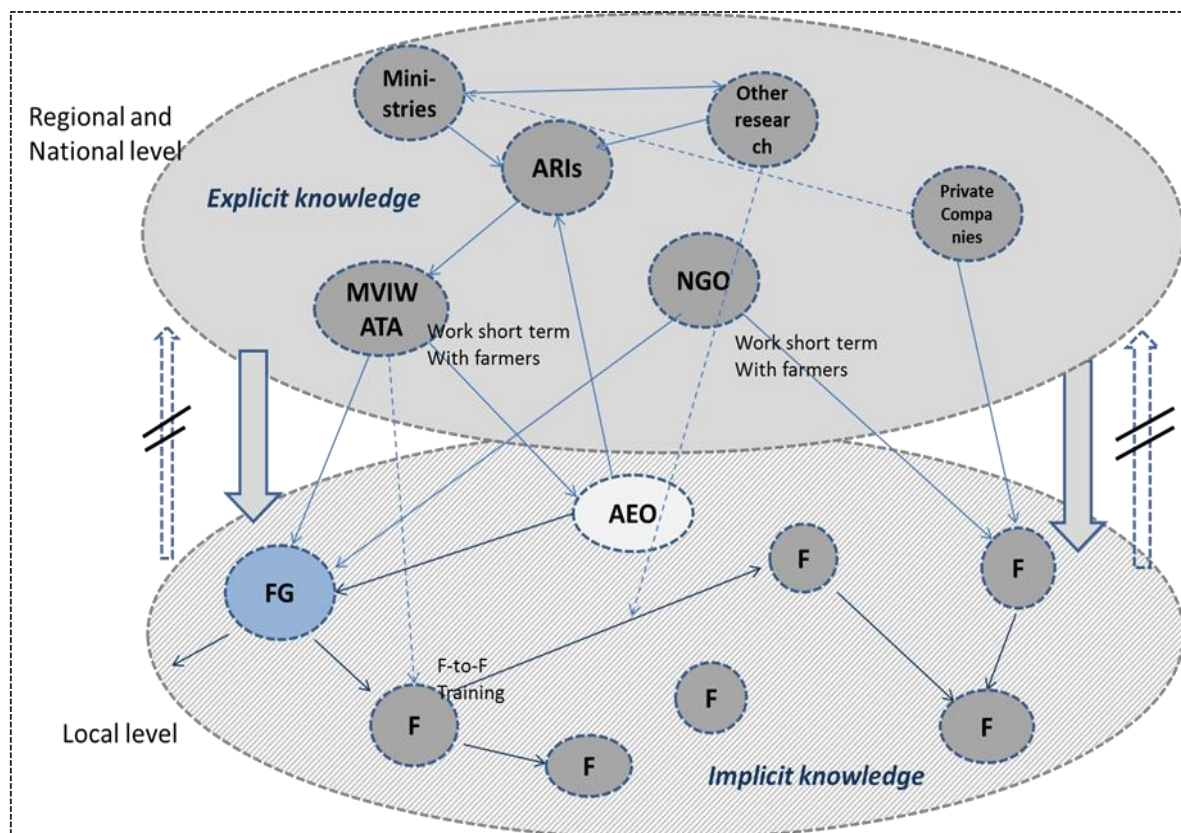


Figure 7: Two spheres of knowledge production and exchange



Politics and Institutions

During the interviews, it was highlighted, that the high number of competing frameworks and involving a great number of actors are mostly ineffective when it comes to implementation on the ground due to a lack of resources, transport or even a lack of officers to implement the national programs and strategies (Interview #1). A consistent opinion was that the ASDP program works best, compared to kilimo kwanza or others because it has clear goals and outcomes assigned (Interview #8). By having a long term perspective and addressing the local level its measures, it is the only one promising an appreciable impact on the ground: *“60% of the ASDP budget is allocated at the districts and should move further down to the villages, some of the money, of course is trapped in corruption, but others is used to implement measures on the ground”* (Interview #3). The experts clearly stated that most policy attempts to address the problem are more perceived as “rhetoric” and “slogans” or “paroles” than working strategies (Interviews #1, 2, 3 and 5). In the interviews (Interviews #2,1 and 8) it was put emphasize on the argument, that the rural population of Tanzania perceives the national policies, like kilimo kwanza (agriculture first), mainly as rhetoric’s and not sustainable having no specific solutions to offer for the smallholder farmers. Therefore, the farmers depend on own experiments and innovations to improve their livelihoods. The NGOs are operating closer to the rural communities and adjust measure more closely to the specific demands of the rural poor. On the other hand side, intervention/missions of NGOs is often not long lasting enough to accompany processes with the farmers. This was consistently mentioned during the FGD as well.

Also it was mentioned, that policies (e.g. for subsidies) are aimed to so called “priority regions” which the governments can determine, because the agricultural sector strongly depends on public funding (Interview #4). Those priority regions are areas in geographical favored regions (like the western highlands), whereas Dodoma for example does not belong to the priority regions.

During interviews there was a general uncertainty if the big private led programs like SAGCOT and BRN will change the situation of the small scale farmers to be better. Two interviewees have pointed out, that farmers along the SAGCOT are now supposed to sell their land, even though they do not



want to (Interview #4). Also, in contrast to the countries strategy one interviewee suspected GMO trials in the SAGCOT region.

Technology and demand

On the element of Technology and demand the response during interviews was not so controversial. The interviewees consistently said that the use of inputs and advanced technology is still very low and needs to be improved. A special stress was put on the use of improved seeds. In the past it has often happened that “fake seeds” were sold to the farmers. It would e.g. have been the task of TOSCI to ensure the quality of seeds that are disseminated in the country. Due to these incidents, farmers are reluctant to use improved seeds in their fields. Also, improved seeds, or hybrids need fertilizers or pesticides, which people cannot afford. *“It is always a package of things that needs to be considered”*, one interviewee highlighted (Interview #5). Crop production is very challenging to the farmers, especially in the semiarid areas, that do not belong to the priority regions and thus, do not receive funding from the government. So by the technology they have farmers can often not reach a standard quality of products that would sell at the market. From the demand side in production the ARIs offers an approach to create client oriented research management (CORMA) which is in place since 2005/06. This is an approach were crop research can be demanded by farmers. This approach is not implemented at the ground, but rather used by ARIs at zonal level (Interview #5) Tanzania has not fully transformed into a market economy, also lacking a reliable private sector in some value chains. This is also visible on the demand side at the local level: it was mentioned that financial support is lacking and a working credit system has not been established yet. Farmers have to pay very high interest rates if they want to loan from a bank. At the same time, farmers depend more and more on credits for their production. This is due to several factors, like droughts, market access or school fees for kids that have to be paid on top. Therefore a lot of Local Saving and Credit initiatives are brought to life, giving farmers the possibility to save many collectively and get small loans from the group if needed. Those local SACCOS play an important role for the rural societies (MVIWATA, verbal information).

Limitation of natural resources



On the topic of natural resources, it was specified that crops were often destroyed by heavy rainfalls or droughts. People are aware of climate change and that it has an impact on their production system at a global scale. But they are also aware of regional problems like deforestation of soil erosion. At the same time, often they do not have other possibilities than cutting wood for fire from the forests, producing charcoal and other things (Interview #2). It was mentioned, that limitations of natural resources and the resulting challenges in crop production for the farmers are the main drivers why farmers adopt innovations at all (Interview #5). There needs to be an in depths interview with natural sciences WP within Trans-SEC to gain more information on the specific situations in the CSS.

Competition

During the interviews, competition was mainly described as a phenomenon that happens among the different institutions and actors on a national level. Even though there is consensus, that food security and the need for innovation is targeted by a number of different ministries and the topic is taken up by many, many programs and acts it was also consensus, that not enough has been done in this respect (Interview #3). It can be condensed to the point that ministries start to compete over budgets and budgets are trapped and do not reach the target level, which are the rural poor. Also regions compete for agricultural subsidies (priority regions- and non-priority regions). This competition leads to content and resource wise overlaps und discoordination of measures on the local level.

Another field where we have competition is crop markets, as in times of surplus production maize is sold all over the country and thus reaches only very low prices (Interview #5). Earlier, people produced just maize because it could be sold everywhere, now there starts to be a shift to other crops again. The competition on the farm level thus is diversification vs. monoculture.

The last one mentioned during the interviews is the competition for young labor force between the rural areas and the cities. There is no support system to get the young people into agriculture, they rather tend to move to the big cities to work there (Interview #3).

Innovation processes

During the interviews it was made clear, that district and national level have only an imprecise understanding of how innovation processes work on the ground. Important drivers of FS innovation processes are visible changes in nature and natural resources, like soil degradation or deforestation



that can be overserved. Those changes lead to higher adoption rates of technologies that promise to address those problems. The wish for higher yields promotes adoption of improved seeds, in the regions where this is possible. Some experts highlight, that the old and linear model of science and research that leads to adoption of new technologies in the rural areas is long outdated and it needs more than an extensionist to “implement” an innovation (Interview #5). More and more the opinion is expressed, that innovation can come from every actor in the system. However, this idea was not supported by all the interviewees. Two stated clearly, that they do not believe in the innovativeness of farmers like the NGOs do and that farmers can contribute only little to the research activities in universities or ARIs (Interviews #3,5)

The target group for FS innovations is the small scale subsistence farmers in rural TZ. FS Innovations are more likely to be adopted by farmers, if they can stand for themselves and do not require additional inputs like pesticides or fertilizers (#2) because, farmers are very much used to do things “*in the old way*” (Interview #8). Another supporting factor is compatibility with local practices, habits and culture. Something that differs greatly from daily habits and rituals will most likely not be taken up into the daily practices of farmers. One expert specifies that innovations have to be “rewarding” for farmers (Interviews #5, 8), in a sense that the innovation has to show impact and pay off economical as soon as possible after introduction on the farm. Obstacles to introduction of (technical) innovations on a local level are at first weak purchasing power. Lacking infrastructure, resources and financial restrictions were mentioned in one or the other way by all interviewed experts (all interviews).

When it comes to new techniques in crop production, people are very much used to do things “in the old way”, as mentioned before. One expert took the example of zero tillage, which is a traditional technique in many parts of the country, often inherited from parents, or taken up from friends or fellow farmers. Some extensionists try to advise people in semiarid areas, that zero tillage is not the optimum handling for the soils in this regions (like Dodoma). But advice is only very seldom taken up and followed by the farmers, even though it is scientifically proved, that this method causes crop stress (Interview #1). Again, we can see cross-reference to other system elements such as knowledge base and human capital. For taking up of innovation levels of trust have to be stressed again, pointing to the fact, that extensionists are not consulted very often by farmers, because they do not believe in them.



Another obstacle is a misguided role understanding on both sides, sometimes farmers are to reluctant to actively take part in innovation processes and contribute their experience based expertise. On the other hand side, the outdated idea of users (farmers) and providers (science) of innovations is still prevailing, inhibiting interaction among the actors in the systems and resulting in many feedback-loops in innovation processes (Interview #1).

Adoption and dissemination strategies of innovation in rural TZ are organized via already mentioned intermediate structures like extension, farmers' radio, as far as in place internet and social media or farmer- to- farmer extension programs as well as farmer field schools, testing and demonstration plots. Bigger enterprises have possibilities for promotion. The agricultural fairs, nani-nani organized in five regions in TZ every year are supposed to disseminate innovation among farmers. The problem here is, that small scale farmers seldom have the possibility to go to the nani- nani, because they are organized in the cities and farmers do not have time and money to travel there (Interview #5). Another interesting dissemination strategy is via schools, where children learn what they later on tell their parents. This is e. g. done in the field of health and nutrition but does not work for complicate technical innovations.

Speaking more in general on the issue, one expert argued, that poverty permanently hampers the ability of farmers to be innovative. This could be addressed by a better self-organization amongst farmers in groups or by other means (Interview #8). Also mistrust among government, farmers and other actors results in a general reluctance to tackle food security in a joint effort.

4.3 Results from Farmer Group Discussions

For the third method Farmer Group Discussions (FGD), the system element innovation processes was focused building on the experience people from the Farmer groups had to share with the research team during the discussions. The other elements were mainly left aside. The main question for the FGD was to ask the farmers, how they dealt with food insecurity and what solutions they choose in the groups to address the topic. There were asked to describe the process they went through with the group, each group having a specific innovation they were working on. We have interviewed three farmer groups, results are therefore not representative, but give us a good understanding about the obstacles as well as factors promoting innovation processes on a local level.



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Actors and Organizations

During the research on a village level, group interviews with farmer groups were conducted, who named different organizations and actors than the experts. The farmers did not mention national food security strategies like kilimo kwanza or ASDP during the interviews, but mainly NGOs or special grassroot initiatives as important actors. Those are: local SACCOS, OXFAM; CODERT; MVIWATA; UMATA, RLDC (Rural livelihood development Company) or in some cases TASAF programs play a role. It was stressed, that e.g. TASAF as a government program was both: an obstacle and a promotor of food security innovation activities.

During FGDs, farmers have expressed that they had also participated in NGOs activities on a village/ farmer group level. But farmer criticized, that NGO activities are mostly of short duration and do mostly not exceed a year. After that there is no follow up of the activities.

Knowledge base and human capital

The famers of the group discussions stressed they needed more information on marketing possibilities, keeping of poultry (feeding and breeding) and how to get credits/ loans for their activities.

Farmers in the three group discussions conducted, stated that ICT did not (yet) play a key role in their information behavior. All farmers from the group discussions confirmed, that they had never used a library / books/ leaflets or other written documents to inform themselves about new agricultural practices and / innovations. They also mentioned that no other actor came to ask them about their experiences regarding specific things they had tried out in their groups.

The other system elements were not mentioned during the FGD and are therefore not further displayed here.

Innovation Processes

"...before I joined the group I did not have a cooking pot, no bicycle, now I do."

(Farmer Group member, Dodoma)

The farmer group members told us that a major practice to initiate innovation processes and to foster interaction among farmers is to form farmer groups (FG). Such groups can be both: self-initiated or they can be initiated by regional / district authorities or projects (as is the case in Trans-SEC). The main reason to form a group is to increase income of the group members and to provide



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a platform for information sharing and to discuss problems with fellow farmers. Also, it is very unlikely to initiate innovation processes as a single farmer. Groups often start off as Credit and savings groups, aiming to save some money which they then can invest in small common projects. In our sample of three FG (outside Trans-SEC) two groups are self-initiated and one group is district initiated. FG take an important function for the village, as they are a main source of information to farmers, as was mentioned earlier. FGs often have more frequent contact to NGOs (like MVIWATA), extension officers, projects or other organizations, as they can be easily contacted and meet on a regular basis.

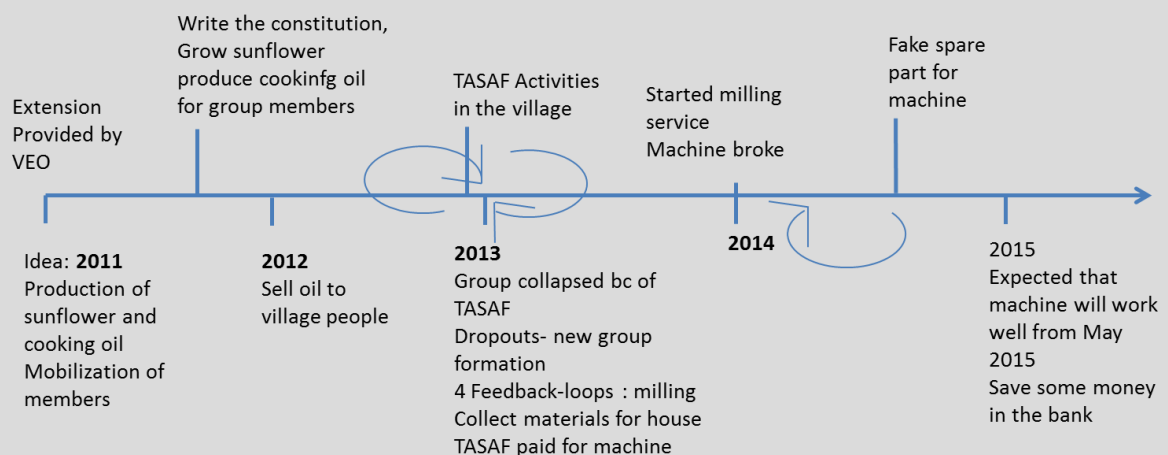
The group interviews with farmer groups working on saving and credit, sunflower and milling and poultry keeping revealed, that a lot of attempts to be innovative and to include new things into daily routines is often difficult, because links to outside the village stakeholders are missing. There are initiatives funding capacity building and local learning processes, e.g. the Participatory Innovation Development (PID) which involve partnerships between local land users.

The three following figures illustrate the processes that farmer groups went through in order to do something differently and to improve their livelihoods and their state of food security.



Group I – Morogoro

The FG had three main activities that had changed over time, from processing activities to service activities. In 2010 the group that consists of members from different sub-villages of Ilakala, started off with the own idea of sunflower oil processing, because cooking oil was not available for them. They grew sunflowers and used an oil press that was already available in the village. In the first year they collected 8 bags of sunflower seeds, in the second they increased the acreage and collected 14 bags. Whilst in the first year they produced cooking oil for themselves they could also sell oil to other farmers in the second year. In the third year the TASAF started to provide money to poor farmers in Ilakala, 100.000 TZS per family member and month. As a result, the group fell apart, leaving too few members to continue the business, which was already starting to grow. The group's members named two main reasons, why the group was so vulnerable to this influence from outside: at 1) some members choose rather to get the money for free, than to stay in the group and have to work for it. The remaining members communicated to TASAF, that they now needed to start a new business idea. TASAF was willing to help kick-start, provided they could choose the type of innovation the group works on.



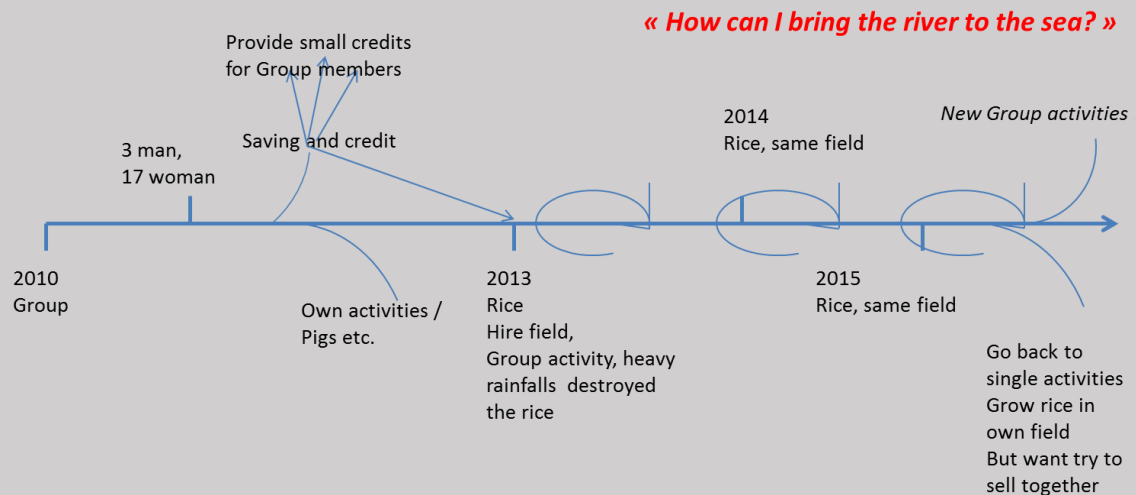
This again, made some farmers 2) drop out of the group, because TASAF is known as an institution that cannot be trusted. Making the argument, that any idea brought about by TASAF cannot be sustainable they left the group. Finally, the remaining members have gone through a selection process with several iteration loops resulting in the new business idea for the group. The group chooses to provide a milling service to other farmers from Ilakala and its sub-villages. The house for the milling-machine was then built by group members; whilst the machine was provided by TASAF. The machine provided by TASAF worked no longer than 1 year, before the group had to order a spare part using up all the money saved during other activities. They received a fake spare part, that could not be used for the machine, and could not be send back either. In early 2015 as the group discussion was conducted, the group had stated that they were doing other activities, like saving to order a new spare part. By then, they expected the machine to be working again in late 2015.

Figure 8 displays the process as it took place in a FG in Morogoro in the village of Ilakala



Group II – Dodoma

The second group has stated that being in a group was not yet paying off for them. As of today, the group mainly consists of women whilst in the beginning, more men were group members. This group was not a legal group and was initiated by the district during a two-day capacity building training on how to form a saving and credit group. During the training, so the members reported, it was an important fact, that meals and drinks were provided, which attracted many people to join the training. Just a few weeks after the training when the group was put in place, the majority of members (overwhelmingly men) dropped out again, claiming the group activities did not pay off for them. Additionally, they had to pay a weekly fee to be allowed to stay in the group as members, which some of them couldn't and others wouldn't do. After the first few months of existence, out of 60 group members, 20 were still members. Their main activities were saving and credit. In the third year, they agreed on doing a joint activity: rice farming. They planned on selling the rice on the market after harvest. To do this, they hired a field from a fellow farmer.



Even though the group members seemed very motivated for this activity they reported that they were not quite sure, whom to approach with questions (e.g. they wished to do a rice nursery). They reported that they did not know how they could approach the village extension officer to get advice on their activities. Also, it seemed that they did not fully trust in his expertise. They could not harvest rice three years in a row, because heavy rainfalls destroyed the harvest because the field was located in a valley. They mentioned that links to other farmer groups and experts is missing and reported demand for several training e.g. crop growing or business management.

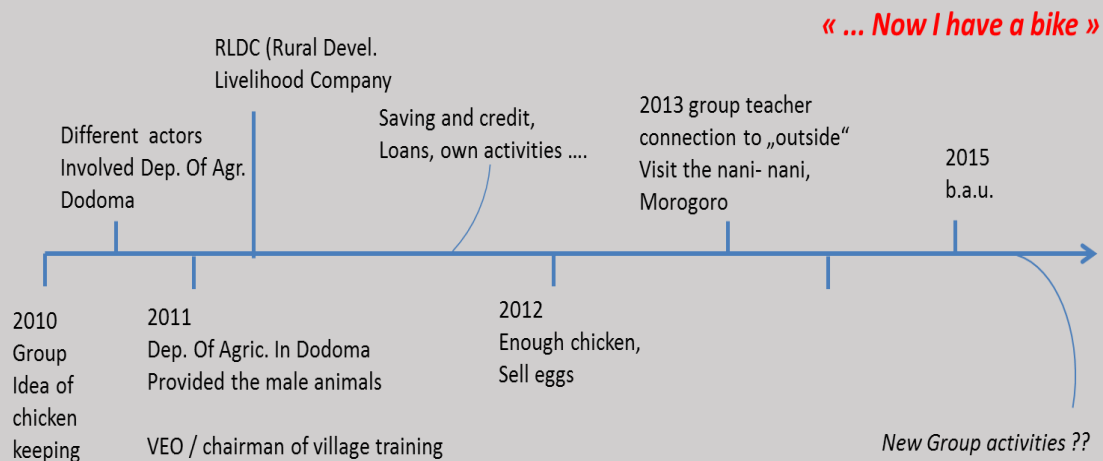
The people from the district who had organized the training to become a group never came back to evaluate, whether their efforts were successful or not.

Figure 9 displays the process as it took place in a FG in Dodoma in the village of Idifu



Group III - Dodoma

The last group was a mixed group working on the poultry keeping in Ilolo / Dodoma. This group is well organized already and the first members start to recognize a positive impact of being a group member. Since the formation of the group, it had constantly grown in members. The group reported, they had different side activities e.g. saving and credit whilst they main activity is poultry keeping. What is special about this group is the contact to outside the group actors, like MVIWATA. The group teacher is a formal member of MVIWATA and realizes contacts and activities for the group. This also helped the group in the chicken keeping activities: district Dep. of agriculture supported the group with the male chicklets from a dual purpose breed. The members started to keep the chicken having a few challenges: vaccination, building of chicken houses, thefts or illnesses. In first place they were keeping all chicken in the same place, realizing nobody felt responsible for feeding and looking after the animals. So they decided to change the strategy. Every member from the group had to take home chicken and take care of them.



The activities like selling eggs or meat continued to be joint activities. In 2013 they had so many chicken that they could start to sell chicken and not just the eggs or meat. Also in 2013 they had the possibility to go to the nani nani in Morogoro an activity that was organized via the MVIWATA contact person and teacher of the group. For many, so they reported, it was the first time to be outside the village at all. They wish to organize such activities more often in the future.

Figure 10 displays the process as it took place in a FG in Dodoma in the village of Ilolo

What are the characteristics of the “innovation processes” in the groups?

Comparing the activities of the three group discussions tells us more about the characteristics, advantages and challenges that FG face. Taken together, group activities were very different, as the



foci were on: Milling (Group I), Rice production / saving and credits (Group II) and chicken keeping (Group III).

There is a high risk that the FGs have no possibility to connect to other system levels, because as mentioned for the system element knowledge base and human capital, knowledge flows as well as interaction happens rather among levels of trust (horizontal), than among levels (vertical). This inability to connect across levels, sometimes leads to the problem, that unsuccessful practices are being reproduced within the groups.

a) Groups are vulnerable to influences from outside

The economic base of these farmers is subsistence farming that means that farmers have had no or very little money before joining the group. One main result is that groups react very sensitive to influences from outside or shifts in the economic conditions different from those under which the group was founded. Also small changes can have severe impact on groups that have e.g. been established to increase household income of its members. In the example a national level program called TASAF began to support poor farmers with money transfer as income supporting measure. This made voluntary members of the FG drop out of the group, because they now could receive the money from TASAF directly. This decreased the total number of group members and motivation to stay in the group so that the initiated process ended completely. In another example with the same group, delivery of a false spare part for the machine, which was the basis for the group's work lead almost to collapse. The part could not be returned easily and there was no money left to buy a new spare part.

Also, climatic events like sudden heavy rains have had influence on one of the interviewed groups. In this case for three consecutive years rains destroyed the rice field, which was a joint activity of the group to increase income. The group had rented a field for this activity and by losing the harvest their FS situation was affected directly, as they mentioned in the FGD.

b) Farmer groups are not connected to local value chains

As innovations (in this case rice farming, chicken keeping or milling) become bigger (meaning production increases) they have to be followed up by activities like marketing of surplus production or management of storage for surplus production. The groups interviewed reported, that their wish was to grow bigger and have bigger projects and to produce more. But the activities needed to follow up the output (rice, chicken) are not addressed in the group strategy yet. The groups were not yet



connected to local value chains to be able to sell surplus product. They mentioned that they find it hard to sell chicken in the market when there is a local overproduction of chicken. Therefore they wished to be closer connected to stakeholders from the value chain, and to receive pricing information that would help them to make informed decisions in the group.

c) Groups need support

Two of three groups had connected to outside the village stakeholders in order to implement their projects; one group did not communicate much with outside stakeholders. The groups are well organized, concerning the rules members have to follow like payment of fees, return of loans, weekly meetings or other bureaucratic aspects, but they did not assess if their intended projects and ideas are realistic. Furthermore they said, they had no methods to do this on their own. After having tried different projects they have reported under the GD, that they wish to receive at least some basic training on entrepreneurship and project management that would help to pre-evaluate costs or effort needed when there is a new project idea.

In a next step, the group members were asked to make a list of obstacles and factors promoting⁶ the processes they were working on. We clustered the responses thematically which is shown in **Table 5**. The idea was to derive conditions to successful FG innovation processes for further testing in the field and in order to be able to reach the aim of Task 8.2 to give recommendation for the dissemination strategies for the Trans - SEC UPS:

⁶ The terms obstacles and promoting factors were not well understood by the farmers. Therefore we re-termed them to problems and advantages.



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Table 5: Developing Categories of obstacles/challenges, advantages and solutions for Food Security problems as named by groups

Category	Group I (legal group, self)	Group II (no legal group, not self-initiated)	Group III (legal group, self)
Advantages			
Content		<ul style="list-style-type: none"> Ability to solve FS problems immediately / together by a specific action 	<ul style="list-style-type: none"> People can tackle problems together
Economic	<ul style="list-style-type: none"> Get loan from group at low interest rate Share Work Sell together Collect money from group activities (milling etc) 	<ul style="list-style-type: none"> Get loan from the group at low interest rate (10%) Only as a group there is maybe a possibility to get funded by government through local SACCOS 	<ul style="list-style-type: none"> Get loan and save money Reduce the (economic) struggling of people to cope with problems More likely to get funded if you are in a group Increase the income of the members, so people can pay fees (e.g. school)
Knowledge		<ul style="list-style-type: none"> Education and training 	<ul style="list-style-type: none"> To get skills and training (entrepreneurial) Get to know other people also from outside TZ Go to nani-nani, visit other places (e.g. Morogoro)
Institutional			<ul style="list-style-type: none"> In a group people have a more stable life than on their own Connected to outside village stakeholder, have a group teacher, member of MVIWATA
Other		<ul style="list-style-type: none"> Get to know each other and help each other 	
Obstacles* / Challenges			
Content	<ul style="list-style-type: none"> Sunflower did not work, now milling (build a house for milling machine, maintenance of machine, false spare parts) 	<ul style="list-style-type: none"> Rice growing (soil treatment, diseases, no tractor available -> prepare soil by hand, beats eat rice, no vehicle for transportation) 	<ul style="list-style-type: none"> Chicken keeping (e.g. keep away from thieves, "bandas" not save for raptors, feeding, vaccination, diseases)



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Economic	<ul style="list-style-type: none"> Low income of group members Have bank account, but no money in bank 	<ul style="list-style-type: none"> Low income of group members No bank account, money is in a trunk No markets to sell products if they have The middlemen pay very little for the products 	<ul style="list-style-type: none"> Low income of group members Getting the loans from group back in time If markets and yields are bad, people start to drop out of the groups Markets are not in place every day -> selling is luck Little markets to sell products (esp. in 2014)
Knowledge		<ul style="list-style-type: none"> Even if knowledge how to do things is there, no money for implementing projects (washing sob) 	<ul style="list-style-type: none"> Lack of skills, i.e. entrepreneurship
Institutional	<ul style="list-style-type: none"> External shocks (TASAF nearly destroyed the group) -> groups are very vulnerable to shocks 	<ul style="list-style-type: none"> In order to sell, sometimes you need to have standard products No connection to outside village stakeholders 	
Other	<ul style="list-style-type: none"> Dropout of group members 	<ul style="list-style-type: none"> Dropout of group members Weather (high rain falls destroys the rice for 3 years now) and location of rice field -> immediately affected their FS 	
Solutions			
Content		<ul style="list-style-type: none"> Would be rice nursery (but would need training on this) 	
Economic		<ul style="list-style-type: none"> For the problem of low income: reduce criteria of group, increase share of members with more money 	<ul style="list-style-type: none"> Problem of low income : payback loans in time Convince members to contribute more money
Knowledge			
Institutional	<ul style="list-style-type: none"> Problem of TASAF: connect to other stakeholders and try new things 	<ul style="list-style-type: none"> Middlemen come and get rice at farm door 	



Figure 11: Group members of MISANI Group attending the group discussion in Idifu village, Dodoma (march 2nd 2015, own picture)

4.4 Discussion

The aim of our report is to provide a baseline study to describe the preconditions for and ways how food security (FS) innovations are being brought about (or not) in Tanzania. The developed analytical framework has proved to be suitable for the object of the study, allowing to incorporate a) different levels of interaction and b) reveal sector-across activities of different actors. The extension of the framework by two more system elements (natural resources and innovation processes) has shown to be rewarding for the understanding of research gaps and the constitution of the conditions under which FS Innovation can occur in Tanzania under similar conditions as in Trans-SEC.

It has shown that results from all three methods (literature review, interviews and farmer group discussions) are consistent in principle and complement each other across levels. The main results are discussed in the following in the light of literature and in **reflection** to the Trans-SEC project so far.

- Results from all three methods suggest that **national policies** and **strategies** on FS and development have only a minor and indirect impact for the success of food security innovation processes on the ground. Anyway, this cannot scientifically be proved yet, because impact has not been evaluated on a local level so far, as evaluation takes place on a national and regional level only.



As a result of this assumption, national level policies have been described; and are perceived as “rhetoric’s” (literature and interviews). Haug and Hella (2013) mention in this regard that Tanzania has a strong history of national hierarchy for the agricultural sector, which is still operationalized in plans and strategies (ibid.). Our results allow to specify why national policies might be perceived as such: those measures do not fully reach down to the local levels to create impact on food security improvement. It was mentioned that one reason is that measures coming from a national level are often not demand driven. This applies also to the research system (being a part of public strategy) which seems to be mainly donor driven [*externally controlled*, Interview #2]. Here, general literature points to the fact that different motivations to do research will ultimately result in different aims and roles (EU SCAR, 2013: 9) and outcomes.

Trans-SEC implicitly addresses the problem by focusing on a people centered approach. For operationalization findings from 8.2 point to specific options for action by a) creating a sound management for the UPS on the ground (e.g. by interactive/ inter-level learning processes), and b) a clear management of the dissemination process (e.g. according to the elements of diffusion and dissemination as defined by Rogers (2003: 11). In this regard, Rogers (2003) hints to theory saying that diffusion can be understood as spontaneous act of spreading, whereas dissemination is planned and directed (Rogers 2003: 6)

- In all three methods it was principally mentioned that not only production related programs are needed to address the issue of FS. The focus should be even more on **market related programs** (improving market access) and **entrepreneurial skills**. When asked what they’d wish for, the farmers from two FGs mentioned trainings on management and entrepreneurship. Those would have been helpful to them accessing the feasibility of ideas beforehand. This opinion is partly conflicting comments from two interviews, stating that “not producing enough” was the main problem for Tanzania’s foods security situation. Nevertheless, a reduction to productivity issues alone could not be confirmed with literature. Rather, there are indications that FS is a complex phenomenon and a wicked problem; as described in the introduction.

Involving different approaches that go beyond productivity improvement can hence be seen as a strength of Trans-SEC.



- **Technological innovation** is often linked to great expectations at the user side, but new technologies often come with numerous prerequisites as well. This was also confirmed by the FG interviewed with regard to the milling machine example, concluding that farmers would have not chosen the machine, if they had known beforehand how much problems, costs and changes in their social systems (Rogers, 2003) it would cause. In this regard, Lundvall et al. (2009) point to challenges for innovation activities in developing countries arguing, that unintended effects have to be considered already when selecting cases and innovations. They argue that: “Innovation examples/ case studies should rather focus on dissemination than on[high]-tech and new-to-market innovations” One reason for this recommendation is that technical advanced innovations face high entry barriers at a local level and tend to exclude the local poor from participation (ibid.). Here, results from this study are consistent with literature, revealing that it is often not regarded that the introduction of a new technology can lead to profound and significant changes in the social structure of rural communities – intended or unintended. More knowledge based innovations can be gradually adapted by farmers (see e. g. the Trans-SEC case of improved stoves or kitchen gardens) to the specific local demands and needs and can therefore be more compatible with local action practices and habits (see also: Rogers, 2003 attributes of innovation).

Our findings encourage the **Trans-SEC** consortium to think beyond technological innovations and focusing on capacity building, learning and dissemination. Where technological innovations are part of the solutions, technical, social and economic implications for their use should be anticipated as far as possible.

- That actors on a national and district level have only a vague and **imprecise understanding** of how **innovation processes** work on the ground can amongst other reasons be traced back to the restriction in communication among the different system levels as was shown for the cases of a) knowledge production and b) the public services (extension system) in this study. Our research has shown that different types of knowledge (implicit and explicit) are being generated within the system. But these two knowledge types that would normally refer to each other are not shared among levels to create know-how in interactive learning processes, which could then serve to find solutions to Food Security challenges. This lack in communication and knowledge exchange makes it also difficult for the actors on different levels to understand the other`s language. A general hint for Trans-SEC could be to include a knowledge integration part in the dissemination strategy (and



thereby enforce the active use of communication channels as mentioned by Rogers (2003:18-20) for successful innovation uptake and diffusion. This argument is also supported by Spielmann et al. (2009) arguing that innovation can be characterized by connecting to other actors, as the process gets more complex, more activities are involved and new / other knowledge is needed in order to systematically upgrade the innovation. This will be worked on from 2016 in Task 8. 2.

- Concluding this chapter, we`d like to point to a **research gap**: standard innovation literature often includes socio-economic questions; but leaves issues of natural sciences unconsidered and does not connect innovation research and natural sciences so far. At this stage of our study we think that regarding the very important question of how the conditions of the natural resources base influences the food security situation of the rural people in TZ and their room to maneuver to take measures/ to innovate are not taken up conceptually in the respective literature.

At this stage of our research we would argue that in Trans-SEC it is to be discussed whether to define interfaces between the socio-economic WP and the natural science WP, and incorporate the findings with regard to the UPS could be a productive way forward in terms of science and Food security improvement. This could create integrated solution pathways that consider both: socio-economic and natural resources factors more explicit. To engage in discussing the conceptualizing of a possible joint thinking could be a tangible contribution of WP 8.2 to the project.



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