



Change of household food security behaviour in the context of the 'Linking Farmers to Markets' project

**A case study of the
'Linking Farmers to Markets' (F2M) project
in Hoima, Western Uganda**

Master Thesis

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Abbreviations and acronyms

a.s.l.	above sea level
A2N	African 2000 Network
BOKU	Universität für Bodenkultur University of Natural Resource and Life Sciences
CDR	Centre for Development Research
CIAT	Centro Internacional de Agricultura Tropical International Centre for Tropical Agriculture
ERI	Enabling Rural Innovation
FAO	Food and Agriculture Organisation of the United Nations
F2M	Linking Farmers to Market-Project
HCP	Hoima Catholic Project
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HODIFA	Hoima District Farmers Association
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IFOAM	International Federation of Organic Agriculture Movements
NAADS	National Agricultural Advisory Service
NARO	National Agricultural Research Organisation
NGO	Non-Governmental Organisation
NRM	Natural Resource Management
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernisation of Agriculture
UNDP	United Nations Development Programme

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1. Introduction

1.1. Personal approach to the topic

As a student of the Master Programme 'Environmental and Bio resource management' at the University for Natural Resources and Life Sciences, Vienna, I was looking for an interesting topic related to developing countries and agriculture. In my point of view, agriculture in developing countries provides potential for sustainable development. Especially people in rural areas mostly depend on agriculture. They are most affected by poverty, and one attempt to find a way out of this indigence is to enable them to strengthen their livelihood. In rural areas in Africa there are mostly small-scale farmers, without adequate market access. The 'Linking Farmers to Markets' (F2M) project, using the Enabling Rural Innovation (ERI) approach, aims to support small-scale farmers to develop profitable agro-enterprises by introducing a transition to organic agriculture.

As a former student of 'Political science' and 'Law and Economics' I have always been interested in the connection between market mechanisms and the impact of markets on people. Market access is a chance, but also involves dangers. Changing the behaviour towards food security despite market orientation is a decisive point and the focus of this study. Market orientation can be in conflict with food security goals of farmers.

Therefore, it is important to find out behaviour changes regarding food security following the 'Linking Farmers to Markets' (F2M) project and evaluate changes of attitude and knowledge in this regard. Investigations of constraints and challenges of farmers are furthermore a decisive contribution to implement improvements.

I will apply my knowledge gained in my broadly dispersed studies, my practical experience in the field of agricultural politics and my ideas and skills to analyse how the household food security situation of organic farmers changed through the F2M project. This should encourage the Centre for Development Research (CDR) to assess the F2M project regarding food security and make it possible to improve and advance the used ERI approach. This aims to help making a broad application of the ERI approach successful.

1.2. Background Information

1.2.1. Country background

Uganda is a landlocked country in East Africa. It is home to a population of 27.2 million (State: 2005), nearly 85% of whom live in rural areas. It is surrounded by the Democratic Republic of the Congo, Kenya, Rwanda, Sudan and Tanzania (CIA, 2010) and has a total area of 241.000 square kilometres, 197.000 square kilometres of which is land area (UNDP, 2010). Approximately 123.000 square kilometres of this land is used for agriculture (CIA, 2010). The climate is tropical and it is generally rainy with two dry seasons from December to February and from June to August. It is a well-watered country with many lakes and rivers. There are several issues causing environmental problems, such as the draining of wetlands for agricultural use; deforestation; overgrazing; soil erosion; water hyacinth infestation in Lake Victoria and widespread poaching (CIA, 2010).

Uganda is rich in natural resources, for example copper, cobalt, hydropower, limestone, salt, arable land and gold. Additionally, it has one of the highest levels of biological diversity because of its diverse topography (altitude of 900-1,500 m a.s.l.), its unique geographical position (it lies on the African plateau) and its moderate climate with an average temperature of 26 degrees centigrade, a minimum between 8 and 23 degrees and a maximum between 18 and 35 degrees depending on the part of Uganda. Due to that it is called the 'Pearl of Africa' (CIA, 2010; UNCSO, 2002).

Despite this, the country's poverty level is high. After a period of poverty reduction since the 1990s, income poverty rose again from 34 % to 38 % between 2000 and 2003. Also, inequality increased markedly in the same period of time. Poverty is especially still severe in rural areas (Appleton, 2001 in Pender et al., 2004; MFPED, 2005).

In spite of its massive growth rates in recent years, Uganda is still one of the poorest countries in the world. According to the United Nation's Human Development Index (HDI), it ranks 145 out of 174 countries, which evaluates life expectancy at birth, the adult literacy rate and per capita incomes (MFPED, 2002; UNDP, 2010).

Uganda's economy is dominated by the agriculture sector, which accounts for 30.8 % of the Gross Domestic Product (GDP; UNDP, 2010). According to the UN Country Profile (UNCSO, 2002), it furthermore accounts for 85 % of the export earnings and 80 % of employment. Especially the rural population depends on agriculture. Low agricultural productivity, land degradation, poverty and thus food insecurity are still consistent problems (Pender et al., 2004).

Thus one main action to promote production, competitiveness and incomes in the PEAP is the Plan for Modernisation of Agriculture (PMA) compiled by the Government of Uganda (MFPED, 2005). According to this central framework, 'Agricultural transformation in Uganda will lead to poverty eradication through a profitable, competitive, sustainable and dynamic agricultural and agro-industrial sector.' (PMA, 2010)

One main objective of the PMA is 'to improve household food security through the market rather than emphasising self sufficiency' (PMA, 2010). To reach these objectives NAADS (National Agricultural Advisory Service) was founded (NAADS, 2011).

Organic agriculture is not mentioned with special regard to the plan. Nevertheless, organic agriculture can be one way to achieve the goals of the PMA and contribute to eradicate poverty. Organic agriculture, although including challenges, potentially improves food security on household level (Walaga & Hauser, 2005) and an opportunity to commercialise small holder agriculture (Scialabba, 2007).

1.2.2. Organic agriculture in Uganda

Organic agriculture is based on the principles of health, ecology, fairness and care (IFOAM, 2009) and therefore includes environmental, social and economical dimensions (IFOAM, 2004).

Farmers in Uganda often cannot afford expensive chemical pesticides and fertilisers. Organic agriculture provides considerable potential for development in this context (Willer et al., 2008). In 2007 almost 300.000 hectares (more than 2 % of total agricultural land) were used for organically production by more than 206.803 organic farmers (Organic-world.net, 2007). Uganda has the largest percentage of land for organic agriculture in Africa (Hauser & Delve, 2007). In East Africa organic agriculture is supported by national organic movements, such as NOGAMU (National Organic Agricultural Movement of Uganda) in Uganda (Willer et al., 2008).

The export of organic production is a globally increasing market. Organic farmers in Uganda are exporting an increasing share of their production (Knudsen et al., 2006), making the country the leading exporter of organic products in Africa (Hauser & Delve, 2007). Export is the driving force of the organic sector in Uganda (Taylor, 2006).

In general, there are two types of organic agriculture in Uganda: certified and non-certified. Certified organic agriculture is market-orientated and driven by the private sector, non-certified agriculture is driven by the civil society and more community development-oriented (Walaga & Hauser, 2005). Compared to conventional markets the share of certified organic sales is relatively low on local markets. Nevertheless, according to Taylor (2006), expectations show an

immense increase of the percentage of certified organic sales during the next few years. Farmers currently receive higher prices for organic products, especially for fresh vegetables. The demand for uncertified organic productions is already strong and also increasing (Taylor, 2006).

Organic agriculture in Uganda is based on small-scale farming, where women are carrying the majority of work load (Hine & Pretty, 2006; Taylor, 2006). Generally, man owns the land (and the organic certificate, if existent) and controls the income, especially if gained through cash crops (Taylor, 2006).

Organic agriculture is, according to the IAASTD-Report (International Assessment of Agricultural Knowledge, Science and Technology for Development), a possible strategy to ensure food security and a chance for rural development (IAASTD, 2008).

1.2.3. Food security situation in Uganda

Although per capita agricultural production worldwide has increased in sum, it varies regionally. In Africa food production per person is 10 % lower today than in 1960 (Hine et al., 2006). The number of undernourished people in Africa has increased by 20 % since 1990. A majority of chronically undernourished people are small-scale farmers in developing countries who produce for their own demand and have no sufficient inputs and no access to markets. In the last years enhancement in the efforts to reduce hunger has been slow (Hine et al., 2006). From 2000-2002, the percentage of hungry people in the total population of Uganda was 19 % (FAO, 2005 in Hine et al., 2006). Especially the number of underweight children has increased in Sub-Sahara Africa compared with other developing regions in the world (Braun, 2005 in Hine et al., 2006).

Therefore, Sub-Sahara Africa still faces a fundamental food security challenge. Food demand will change in the future because i) economic growth improves people's purchasing power; ii) rising urbanisation encourages people to adopt new diets and iii) climate change is influencing both land and water resources (Hine et al., 2006). By the next generation nearly 84 % of world population will live in the so-called 'developing world' and will thus be influenced strongly by increasing land and water degradation. That poses a threat for food security, especially for rural people in developing countries, who often depend on degradation-prone lands (Uphoff, 2002, in Hine et al., 2006).

Although Uganda is regarded as food secure at the national level (FAO, 2005 in Hine et al., 2006), according to Bahiigwa (1999) 41 % of the households are affected by permanent food insecurity. Because of seasonal fluctuations, even more households in Uganda are concerned to be temporally food insecure (Bahiigwa, 1999). There are differences between the regions. Whereas

the northern part of Uganda is considered as food insecure, western Uganda, where the study area is located, is considered as food secure, according to a nationwide study of Bahiigwa (1999). Nevertheless, food insecurity also exists in this part of the country. Food security is a challenge both on national and household level and needs further progress. Reasons for the food insecurity are mainly inadequate rainfall, pests and diseases and excessive rain, according to Bahiigwa (1999).

1.2.4. Enabling Rural Innovation (ERI)

Enabling Rural Innovation (ERI) is a development using participatory methods to strengthen capacities of farmer groups to develop profitable agro-enterprises (Kaaria et al., 2007). This way, rural communities should become an active partner and trigger changes in the behaviour, roles and power relationships (CIAT, 2005). The ERI approach aims to support communities by improving food security and by effecting rising income through more competitive farming (CIAT, 2005). According to Kaaria et al. (2007), farmers should 'produce what they can market rather than try to market what they produce' and are encouraged to pay special attention to natural resource management (NRM) in production (Kaaria et al., 2007).

The approach is based on four main concepts:

- Resource-to-consumption conceptual framework

The approach aims to include the aspect of resources into the whole commodity chain. This involves the process from production to home consumption or marketing, including gender and equity (CIAT, 2005). Thus forward and backward linkages between NRM, agriculture production and markets should be strengthened (Hauser & Delve, 2007).

- Market orientation

The ERI approach focuses on creating an entrepreneurial culture. Building links to local markets and business partners, identification and analysis of potential markets, development of agro-enterprises through collective action and local networks are key steps to create a market culture at the community level (CIAT, 2005).

- Balancing market risk and food security

Farmers have to decide what to produce and for what to use scarce resources. There is a trade-off between productions of cash crops against household food consumption (Hauser & Delve, 2007). ERI aims to support farmers to find a suitable balance between household food security performance and income rising activities (CIAT, 2005). In particular poor people including rural women should benefit from the approach (Kaaria et al., s.a.).

- Participatory approaches for research and development

The participatory component is central in every stage in the ERI-process. This ensures to adapt actions of farmers to local conditions and demands. Farmers are actively integrated into ongoing processes. Participatory approaches are often associated with investments into human and social capital and empowerment (CIAT, 2005).

The ERI process includes (1) the Participatory Diagnosis (PD) and community visioning, where farmers are searching for future livelihood goals, with special attention to gender and stakeholder analysis, (2) the Participatory Market Research (PMR), where the farmers identify market opportunities for agricultural products to increase income and employment to realise their goals, (3) the Farmer Participatory Research (FPR), where farmers form research groups to experiment with potential crops to cultivate to gain knowledge and skills, (4) the Enterprise Development (ED), where agro-enterprises are developed according to the results of PMR and FPR, and farmer groups merge their trading power to produce the appropriate quality and quantity of commodities for their markets, and (5) Participatory Monitoring & Evaluation (PM&E), where achievements and goals are reflected, re-planned and changes needed implemented to institutionalise learning and change processes (Hauser & Delve, 2007).

Critical factors for success are the creation of effective local partnerships of the community with researchers, extension workers, the private sector and different governmental and non-governmental organisations and the building of human and social capital for empowerment. Facilitators play a central role to support the community to improve performance. Also, the promotion of gender equity is crucial in the ERI approach. Women's empowerment is a cross-cutting issue at all stages of the ERI process. Both men and women are addressed to participate actively in the process, while creating gender awareness on community level through interactive methods (CIAT, 2005).

Gender equity, for example in decision-making and food consumption, is essential to the ERI process (Sanginga et al., 2004). Women are the major work labour force in agriculture in many

regions of Uganda. They are not recognised for this and are often less educated (Hine & Pretty, 2006). Often it is argued that market orientation forces female farmers to turn their labour from production of food crops for household consumption. Therefore, gender aspects are decisive to household food security and the ERI process.

ERI is the central approach used in the F2M project, where the study was carried out. The F2M farmers have undergone the ERI process, from the PD to the PM&E phase. Changes triggered through the F2M project are related to the activities within the ERI process.

1.2.5. Linking farmers to markets (F2M)

One project using the ERI approach is the F2M-‘Linking farmers to markets’ project in Hoima and Mukono, Uganda. The F2M project was conducted in two phases, namely ‘Linking farmers to markets: Developing sustainable innovation systems to improve the competitiveness of smallholder organic agriculture’ (F2M I) from 2003 to 2006, and ‘Going to scale: Developing strategies for scaling out market-oriented organic agriculture from farmer group to association level’ (F2M II) from 2007 to 2010. The Enabling Rural Innovation approach was adapted to organic agriculture for the methodological backbone of the project.

The overall goal of the F2M project was ‘to contribute towards poverty alleviation, food security, improved nutrition and better resource management through market-oriented organic agriculture’ (CIAT and BOKU, 2006). The purpose of the project was furthermore ‘to empower farmers in selected communities (with emphasis on gender and marginalised groups) and other key stakeholders to identify market opportunities, develop sustainable community-based agro-enterprises, and better manage their natural resources at farmer association level within sub-counties’ (CIAT and BOKU, 2006). This aims to raise the productivity and the incomes of communities in the project area through linkages of the agro-enterprises to natural resource management (CIAT and BOKU, 2006).

Through partnerships on international and local level with research and development organisations and the private sector these objectives should be reached. International research institutes participating were CIAT (International Center for Tropical Agriculture) and CDR (Centre for Development Research) in cooperation with the Department of Sustainable Agricultural Systems at BOKU (University of Natural Resources and Life Sciences) in Vienna, Austria. Project partners in Uganda were the private sector (AMFRI farms) as well as local NGOs (CIAT and BOKU, 2006). Facilitators of the local NGO African2000Network (A2N) guided the F2M farmer groups in Hoima through the ERI process and carried out trainings within the project.

Training

According to a local facilitator of A2N, the farmers received different trainings within the framework of the F2M project. These trainings differed according to the decisions of the farmers during Participatory Diagnosis (PD) and included mainly training on experimentation, data collection (of market information), group marketing, saving & credits, gender, HIV/AIDS, monitoring & evaluation, record keeping, group dynamics and sustainable agricultural practices (which included mainly organic principles, composting, pest and disease control, water and soil conservation, agro-forestry, kitchen gardens, partly nutritional needs).

According to the A2N-facilitator, food security was a cross-cutting issue during all trainings. The focus was on raising the awareness of being with enough food for home consumption and the importance of balancing between cash and food crops. Furthermore, they learnt about the importance of storage, kitchen gardens and child nutrition.

1.2.6. State of Research

There are a number of studies and reports aiming to understand household food security (Webb et al., 2006), especially with regard to organic agriculture (Scialabba, 2007; Zundel & Kilcher, 2007; UNEP-UNCTAD, 2008). According to Zundel and Kilcher (2007), organic agriculture makes food available to the poor and offers new income sources. Through additional income from organic products farmers should be able to purchase food for household food security (Hauser & Delve, 2007). But critics argued that organic agriculture endangers food security (Bolwig et al., 2007). Managing trade-offs between household income generation and household food production is therefore additionally challenging (Walaga & Hauser, 2005).

Studies show that 95 % of households in Uganda depend on own production as the main source of food (Bahigwa, 1999). Nevertheless, the Plan for the Modernisation of Agriculture (PMA) suggests improving household food security through markets rather than food self-sufficiency (MFPED, 2005).

According to Bahigwa (1999) the main coping strategy in Uganda for food insecure households is to buy food at the market. Therefore there is, especially during times of food shortage, a high dependency on markets. But often households are unable to earn income through poor market orientation. Because of household demands (such as education and health expenses) farmers are forced to sell their products soon after harvesting, when prices are lowest. To meet their financial needs, farmers have to sell more of their production than they would have to off-season for the same demand (Walaga & Hauser, 2005).

Although there is broad awareness of reasons and challenges to food security and despite implemented food security programmes, there is a lack of understanding why so many are still food insecure (Abebaw et al., 2010). Detailed evaluations of these programmes regarding household food security are therefore meaningful.

According to Pinstrup-Andersen (2009), household food security is only indicative about the nutritional status of its members if it is combined with household behaviour. Only a thorough understanding of household behaviour provides a useful input into planning and implementing policies and programmes to improve nutrition (Pinstrup-Andersen, 2009). Until now there is a lack of profound understanding of food security behaviour, especially with regard to organic agriculture.

There are various studies dealing with behaviour change related to different topics, such as HIV (Fishbein, 2000; Gallant & Maticka-Tyndale, 2004) or malaria interventions (Panter-Brick et al., 2006). These studies revealed that behaviour change is difficult to initiate and sustain. Therefore, there are a number of theoretical models aiming to enhance the understanding of behaviour change (Panter-Brick, et al., 2006).

Established determinants of behaviour change are attitude and knowledge (Fishbein, 2000; Gallant & Maticka-Tyndale, 2004; Panter-Brick et al., 2006). These determinants were chosen to explain changes of food security behaviour because many theories specify attitude as a proximal determinant of behaviour (Gallant & Maticka-Tyndale, 2004) and organic agriculture is stated as knowledge driven (Scialabba, 2007; UNEP-UNCTAD, 2008). Also, the World Summit on Food Security organised by the FAO in 2009 declared to be planning to improve access to knowledge to enhance food security processes (FAO, 2009). Gaining new knowledge to overcome constraints and to enable farmers to maintain the balance between food security and market orientation is decisive during the ERI process used in the F2M project (Sanginga et al., 2004). ERI in this way aims to strengthen and sustain capabilities to make farmers agents of their own change (Sanginga et al., 2004).

Research in order to gain a profound understanding of behaviour changes regarding food security of small-holder farmers is needed (Webb et al., 2006).

1.3. Research challenges and justification

As shown in previous chapters, the study focuses on the impacts of the F2M project on household food security of organic farmers. This is analysed by the project in Hoima, which is using the ERI approach. The purpose is to reach an understanding of how the F2M project

influences household food security, through analysing the behaviour changes of the organic farmers participating in the project.

The findings of the study should provide an understanding of household food security behaviour and the changes through the project activities. Furthermore, it should come up with recommendations in order to strengthen the ERI approach for a broader application. Evaluating the F2M project in regard to one of its major goal, namely food security, is central for amendments, improvements and succeeding at further implementations. Furthermore, to analyse the different factors for food security behaviour can be crucial to understand the way organic farmers think. Analysing the knowledge change is critical to point out the purpose and success of trainings and other activities within the project. This could lead to identify important key points of the learning process, which is essential to gain knowledge and further useful skills.

To identify environmental constraints, which are important for food secure behaviour, is crucial and can be important to realise which circumstances are necessary to perform food-securely. It may become apparent in which way circumstances should be changed. This should make it achievable to create a surrounding, where food secure behaviour is possible.

All these findings can be relevant to improve the F2M project, by understanding different processes and factors of behaviour change better. Considering the outcomes of this study can also be relevant for the ERI approach regarding food security issues.

And, finally, the study may promote the F2M project and the ERI approach. It might point out contributions to create an improved food security situation for organic farmers in Uganda and beyond. Analysing the advantages and disadvantages of ERI may reveal the potential of the approach to improve food security. If considered to be a successful strategy to face development challenges, it will possibly be taken into consideration by policy makers, NGOs and other important stakeholders involved in rural development and organic agriculture.

The work aim is therefore to assess the changes of behaviour of organic farmers regarding food security on the basis of the 'Linking farmers to markets' (F2M I) and the 'Going to scale' (F2M II) projects in Hoima, Uganda.

2. Objectives

2.1. General Objective

The aim of the study is to reveal how and why the behaviour of farmers towards household food security changed, the influence of attitude and knowledge on behaviour change, and which impact behaviour change has on the food security situation.

2.2. Specific Objective

The specific objectives are:

1. Analysing the overall food security situation and the changes that happened.
 - Looking at the food security situation and the changes based on the food security dimensions.
2. Revealing food security behaviour and changes based on the food security dimensions.
 - Pointing out how attitudes toward food security changed and influenced food security behaviour.
 - Revealing the knowledge change related to food security and the influence on food security behaviour.
3. Identifying demographic criteria and environmental constraints influencing food security.

2.3. Research Questions

How and why has the food security behaviour changed during the last 5 years and what are the impacts on the food security situation?

Q1: What is the current food security situation and how has it changed during the last 5 years?

Q1.1: How is the *overall* food security situation and how has it changed?

Q1.2: How is the situation based on *food security dimensions* and how has it changed?

Q2: What is the current food security behaviour (based on food security dimensions) and how has it changed during the last 5 years?

Q2.1: How has the attitude regarding food security influenced behaviour?

Q2.2: How has knowledge about food security influenced behaviour?

Q3: Which other circumstances (demography, household constraints) are influencing food security?

3. Conceptual framework

3.1. Definition - Food security

The World Food Summit of the United Nations Food and Agriculture Organisation (FAO) 1996 in Rome defined food security as follows:

Food security is a condition under which 'all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (FAO, 1996).

There is a more precise definition regarding household food security by FAO:

'Households are food secure when they have year-round access to the amount and variety of safe foods their members need to lead active and healthy lives. At the household level, food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household' (FAO, 2011).

These definitions of (household) food security include mainly four dimensions: availability of food, access to food, utilisation of food, and stability.

Availability indicates that a sufficient quantity of food of appropriate quality, either from domestic or external production, such as food aid and net imports, is available.

Access refers to the ability of individuals to acquire appropriate food for a balanced diet through adequate resources or entitlement. Income and infrastructure are key issues for access to food.

Utilisation includes the state of nutritional supply. All physiological needs have to be met. It refers to the aspect of a balanced diet, clean water, sanitation and health care, and therefore also to non-food issues. Also, distribution within the household is an important element, according to the definition.

Stability refers to the persistence of food security throughout the year. Food has to be available at all times. Also, sudden shocks (like climatic events) or cyclical events (such as seasonal fluctuations of food security status) should not hinder the availability or access to food (Scialabba, 2007).

The study aims to analyse household food security along the four dimensions by selected factors as illustrated in table 1.

Table 1: Analysed factors along food security dimensions

Dimension	Situation analysed by ...	Behaviour analysed by ...	Attitude & Knowledge analysed by ...
Overall	<ul style="list-style-type: none"> - Self-perception of overall food security situation - Times of food shortage - Food security situation of children 		<ul style="list-style-type: none"> - Meaning of the term 'food security' - Knowledge about child nutrition
Availability	<ul style="list-style-type: none"> - Yields 	<ul style="list-style-type: none"> - Use of land for food crops - Degree of self-sufficiency - Decision-making patterns (Cultivation) 	<ul style="list-style-type: none"> - Importance of food security (Knowledge about improved farming methods)
Access	<ul style="list-style-type: none"> - Income 	<ul style="list-style-type: none"> - Use of land for cash crops - Share of purchased food - Spending for food consumption - Decision-making patterns (Money spending) 	<ul style="list-style-type: none"> - Importance of cash crops vs. food crops - Knowledge about improved farming methods
Utilisation	<ul style="list-style-type: none"> - Quality of food 	<ul style="list-style-type: none"> - Food composition - Frequency of eating vegetables (meat, fish, milk, eggs) - Intra-household distribution patterns 	<ul style="list-style-type: none"> - Importance of dietary diversity - Importance of vegetables - Knowledge about food preparation - Importance of equal distribution
Stability	<ul style="list-style-type: none"> Food availability calendar 	<ul style="list-style-type: none"> Storage: (Storage facility) - Storage of total yield - Storage for food shortage - Duration of storage 	<ul style="list-style-type: none"> - Importance of storage - Knowledge about storage

3.2. The framework of behaviour change

In order to get a better understanding of behavioural changes, the study is based on the integrative model of behavioural prediction by Fishbein (2000). Up to now this theory was mainly used to analyse behaviour interventions in public health and HIV prevention strategies (Fishbein, 1998; Fishbein & Yzer, 2003; Panter-Brick, Clarke, Lomas, Pinder, & Lindsay, 2006).

Analysing the change of household food security through the integrative model of behavioural prediction by Fishbein is therefore a new attempt to describe direct and indirect factors of behaviour change towards food security in organic agriculture and among members of ERI-farmer groups.

For this purpose, the model was adapted in some parts, as recommended by Fishbein (2000), to make an application appropriate and take the context into account. Therefore, within this thesis differences due to culturally specific determinants are considered and adaptations are made due to the context of organic farming and the F2M project.

Panter-Brick et al. (2006), who used the Fishbein-Model (2000), pointed out that intervention strategies can be applied in every point of the integrative model. This is crucial to make an assessment of the impacts. The intervention strategy, for this study the F2M project, triggers and stimulates changes and is essential for behaviour change and, in the following, the change of the overall food security situation. The integrated model of behaviour change prediction (Fishbein, 2000) defines important key steps which have to be taken into account as soon as designing, implementing and evaluating interventions to make a strategy successful (Panter-Brick et al., 2006).

The integrative model of behavioural change prediction, Fishbein (2000)

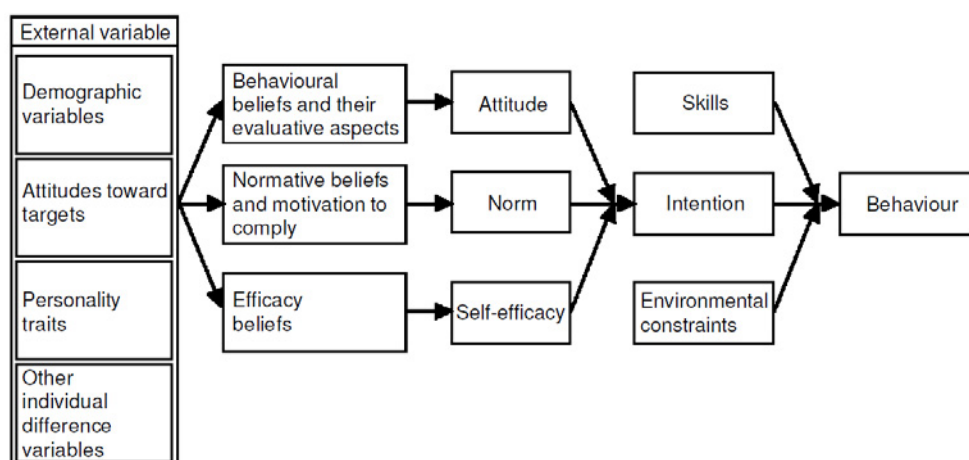


Illustration 1: Integrative model of behavioural change prediction by Fishbein (2000)

The integrative model of behavioural change prediction (see Illustration 1) is based on several different leading theories of behaviour change and behavioural prediction.

These are on the one hand the **Social Cognitive Theory** (Bandura, 1986,1997 in Fishbein et al., 2003) according to which the belief in benefits of performing is essential, and which includes that the persons performing must have self-efficacy. On the other hand it is based on the **Theory of Reasoned Action** (Ajzen et al., 1980 in Fishbein et al., 2003). In this theory the strength of a person's intention towards performing a specific behaviour is central. The intention is determined by two factors, namely attitude and subjective norms regarding the behaviour (Fishbein et al., 2003)

In this way, these theories identify the specific variables 'attitude', 'subjective norms' and 'self-efficacy', as explained in more detail in the following remarks. These variables can be recognised as determinants of any given behaviour and form the basis of the integrative model this study relies on.

As mentioned above, the main behavioural theories suggest that three determinants are crucial for a person's **intention** and thus to perform a specific behaviour:

- The person's **attitude** towards performing the behaviour, namely if one has positive or negative feelings about the behaviour, is the first vital point. Attitudes in this case consist of behavioural beliefs if the behaviour will lead to certain outcomes, and the attitude toward these outcomes.
- A further determinant is **perceived norms**, which includes both perceptions of what others think one should do and perceptions of what others are doing. These norms are derived from normative beliefs of a person or a group regarding if one should or should not act in a specific way. Furthermore, the motivation to comply is decisive. This can be expressed in the degree to which one is willing to perform as it is expected by those the person interacts with. The more social pressure, the more one will be willing to perform the recommended behaviour.
- **Self-efficacy** is the third point and means that a person believes that she/he can perform a specific behaviour and has the necessary skills and ability to do so, also in the face of difficulties or hard circumstances. The more a person believes in this, the stronger his or her self-efficacy contributes to a behaviour change. To keep the conceptualisation of the study at a manageable level, we disregard to consider self-efficacy.

Depending on type of behaviour and population concerned, the importance of these three factors varies. A specific behaviour can be more attitudinally driven in one population and more normatively in another. Furthermore, there are external variables affecting these three dimensions.

The model moreover includes environmental constraints, which prevent, and skills, which enable behaviour changes (Fishbein, 1998, 2000; Fishbein et al., 2003).

3.3. Adaption of the integrative model to the context

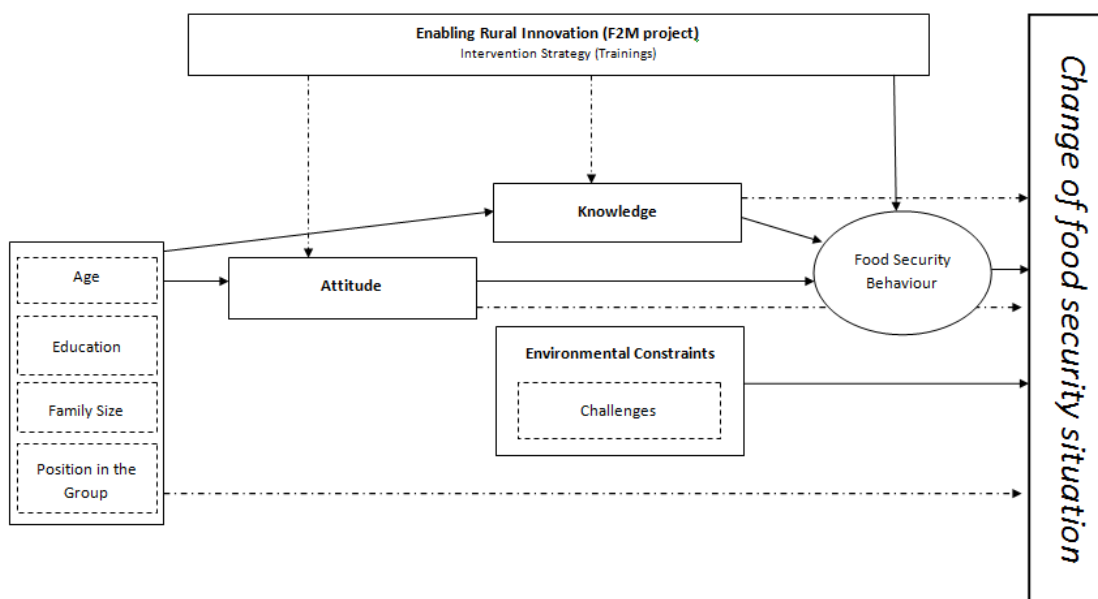


Illustration 2: Model of behaviour change (own illustration)

Through adapting and supplementing factors (Fishbein, 2000), which seem relevant to reveal food security behaviour change through the F2M project (see Illustration 2), the usage of this model seems valuable. It can contribute to identify key components of behaviour that determine the overall food security situation.

In his model, Fishbein (2000) pointed out the importance of skills which enable a person, in our case the organic farmers, to perform a specific behaviour. Organic farming is a knowledge-based approach, according to Scialabba (2007). Therefore, for the purpose of the study, it is focused more specifically on knowledge instead of skill. The knowledge gained through the F2M project will be analysed to find out why the farmers are using knowledge, when it is translated into behaviour, and how knowledge influences the overall food security situation.

In order to simplify the dimension of intension it is reduced to the factor 'attitude'. The impacts of attitude directly on behaviour and the overall food security situation will be analysed in this study.

Also the external variables were adapted. To keep the analyses comprehensible, external variables postulated by Fishbein (2000), such as personality traits and other individual difference variables, were omitted. The external variables are limited to demographic criteria, such as age, education level, family size and position in the group. Influences of these variables on attitude and knowledge and on the overall food security situation will be investigated within this thesis.

For the study it is also essential to analyse the environmental constraints to find out important factors for performing food security behaviour. Interventions can be adapted to that. This should make it possible to remove or minimise these constraints. In order to simplify observations directly, the impacts of constraints on the food security situation are analysed.

The integrated model which has been limited to these criteria, relevant for organic farming and food security issues, should enable us to analyse the factors of behavioural change.

The study aims to find out the contribution of the F2M project to a changed food security situation. This should help to find strengths and weaknesses of the project regarding household food security.

4. Methodology

4.1. Research design

As shown in the previous chapters, there is a lack of understanding about processes of behaviour change, especially related to food security behaviour in organic agriculture. Behaviour change is often explained through models in which environmental circumstances and the contextual framework enable people to change their behaviour. This research also focuses on the social aspects influencing small-scale farmers' behaviour related to food security. This will help understand the attitude towards food security behaviour and the importance of gaining knowledge through trainings. Therefore, the change of attitude and knowledge as a prerequisite for behaviour change will be investigated. The interdisciplinary approach of the study will help identify important factors for behaviour change and reveal key components for a successful intervention regarding creating awareness and gaining knowledge of food security. Furthermore, crucial environmental constraints will be investigated, which prevent behaviour that enhances food security.

To reveal these developments, a case study approach is chosen as research design. It is most suitable to find out individual behaviour and social phenomena by analysing how and why specific independent variables are influencing dependent variables such as behaviour (Yin, 2003). According to Meinen-Dick et al. (2004), a case study is furthermore an appropriate approach for studying collective action. An ex-post analysis was carried out to reveal the changes that happened.

Basically both qualitative and quantitative methods are used. This ensures a broad view and allows both the use of standardised evaluations and measurements as well as it leaves space for interpretations (Atteslander, 2008), which is especially crucial to reveal attitudes regarding food security. Nevertheless, the focus lies on analysing quantitative data gathered through individual interviews. Qualitative data, gained through group discussions, is used to supplement information and to illustrate changes in more detail. In the case using data from group discussions this will be mentioned each time within the chapters. Furthermore, control groups were interviewed to show differences between F2M farmers and non-participants. Control groups are essential to verify a correlation between the intervention and the changes detected.

Fieldwork took place in Hoima, Uganda, East Africa. Data collection has been carried out through individual interviews, group discussions and partly observations of the participants of the F2M

project in Hoima. This made it possible to answer the research questions and evaluate the F2M project regarding one of its main goals, namely food security.

4.2. Study area

To ensure structured fieldwork the location of the study site and the sample unit were fixed before starting the data collection process. The research area is located in the district of Hoima, western Uganda, East Africa (see Illustration 3). Field work was carried out in August and September 2010. Groups participating in the 'F2M-Linking farmers to markets'-project are located in different villages of Hoima. Local partners, as well as BOKU and CIAT are cooperating within the project with local farmer groups (CIAT and BOKU, 2006).



Illustration 3: Location of study site in Hoima district, western Uganda (ICIPE, 2011)

Hoima is located in western Uganda and surrounded by the districts of Kiboga, Masindi and Kibaale. In the west Lake Albert defines the border to the democratic Republic of Congo. The district is one of the lowest and hottest areas within Uganda (Rwabwoogo, 1996). Farming is the most important source of livelihood in Hoima. Around 95 % of all people depend on agriculture, mostly subsistence farming. Market access is mostly limited for local farmers. Some sell their products to traders directly at the farm, but normally at low prices (Fötsch, 2008).

Several NGOs are working in the district in different fields. Beside the project partners CIAT and A2N, the Hoima Catholic Project 'Tugende omumais' (HCP-one step forward), UNDP (United Nations Development Program), HODIFA (Hoima District Farmers Association), NARO (National Agricultural Research Organisation) and World Vision are working with farmers in the area, to

name only some organisations. Additionally, NAADS (National Agricultural Advisory Service), a governmental organisation for agricultural services, provides trainings and partly livestock and seeds to farmer groups. NAADS was founded through the Plan for Modernisation of Agriculture (PMA). The plan aims to transform subsistence farming to market-oriented agriculture for commercial production (NAADS, 2011). NAADS cooperated with the F2M-project.

4.3. Sampling

For this research five farmer groups, which are involved in the F2M project in Hoima, were purposively sampled (Patton, 2002). They have undergone an ERI-facilitated transition process to organic agriculture.

Group members of F2M groups mostly live in the same village and are located nearby each other. Chair-persons organise group activities and inform group members to participate in meetings and ongoing events. Most group discussions were hosted by chair-persons. Some members form different committees within the groups, such as market research or disciplinary committees. They take over special tasks, such as carrying out market research or deciding about disciplinary consequences. The F2M-groups are generally mixed regarding gender, but actually in most groups more female members can be found.

Two groups are from the 1st generation, which have been in the F2M project since 2004, and three groups from the 2nd generation, which have been part of the project since the second phase in 2007. This is important in order to make the results comparable with similar research works carried out in relation with the F2M project in Hoima (e.g. a study about PMR by Florian Herzog, 2011).

See

Table 2 for the detailed sample frame of the study.

Also, control groups which are not part of the project were included. The households of the control group are as similar as possible to the target group households to provide comparable and satisfactorily exact data. Selection of adequate control groups was therefore done with local facilitators. The farmers of the control group were also formed in groups, mainly in NAADS groups. One group was formed due to a piggery project from a local church.

Indirect effects, as for example spread of knowledge and attitudes through contact with F2M farmers, have to be taken into account as well as knowledge of the F2M farmers gained from other than F2M trainings.

60 individual interviews with female farmers were carried out. This is due to the assumption, that female farmers have more insight into the food security situation of the household. Men

tend to describe the food security situation better than real circumstances are, according to key informants. The female informants were selected randomly within the groups. To gain more information about attitudes and changes also group discussions with each group were carried out. Both male and female group members participated in these group discussions. Furthermore, to gain general background information about trainings, one key informant interview with a local facilitator of the F2M project was carried out.

The results presented are based on the comparison of two sample units. The unit of main interest is the project unit. This unit consists of first and second generation groups of the F2M-project. Two groups of the first generation, three groups of the second generation and four groups of the control unit were investigated. 20 individual interviews with female farmers of the first generation, second generation and control group were carried out, respectively.

The analysis partly differentiates between low performers (self-assessment of food security situation stagnation or decrease during the last 5 years) and high performers (increase of self-assessment during the last five years). This should underline and illustrate how differently changes are influencing the development of the overall food security situation. The information gathered should show us the differences between groups which are part of the project and the ones which are not, and between low and high performers of these groups.

Table 2: Sample frame of the study

Group / Generation	Total number of informants	Group name	Total number of group members (female/male)	Number of informants per group
1st generation (2004-2010)	20	Tweimukye farmers Group	23 (19/4)	14
		Tukolere hamu farmers Group	12 (6/6)	6
2nd generation (2007-2010)	20	Bulyango Abeteraine farmers group	14 (10/4)	7
		Kwegondeza farmers group	16 (8/8)	8
		Kugonza farmers group	10 (5/5)	5
Control group	20	Mugisa farmers group	12 (7/5)	6
		Tukolere hamu women's farmers group	10 (10/0)	4
		Katwesige farmers group	15 (8/7)	7
		Tugonzagane farmers group	20 (12/8)	3
Total	60			60

4.4. Data collection

In particular, quantitative tools were used to meet the research objectives. Qualitative methods were used to get additional information. Quantitative methods were used to get information about the extent of food security behaviour on household level, qualitative methods for food security behaviour on group level. The main focus is on the changes of food security behaviour on household level, supplemented by the situation of the group. Background information about trainings was gathered through a key informant interview with a local facilitator. Consultation of local actors and experts was crucial to identify and to contact partners which are central for the topic. To create a theoretical frame for the study, relevant literature, such as books (national and international), reports, publications from other projects, case studies, magazines and monographs, are considered and scanned for pertinent information. This data is summarised in the first chapters of the study and gives an overview of the country background, the food security situation in Uganda, the role of organic farming for food security, the ERI approach and in particular the F2M project in Hoima.

Table 3: Methods and tools

Data collection Methods & tools	Key informant interviews	Semi- structured interviews	Group discussion	Observations	Literature review
Collection of background information	X			X	X
Information about attitudes towards food security		X	X	X	
Knowledge transfer through F2M trainings		X	X		
Information about F2M trainings	X	X	X		
Individual food security behaviour		X		X	
Group food security behaviour		X	X	X	
Demographic variables		X		X	
Characterisation of the group	X		X	X	

During all research work a qualified translator translated the individual interviews as well as the group discussions directly from the local language Lunyoro into English and vice versa.

4.4.1. Group discussion

To get a better understanding of group dynamics and to evaluate ERI trainings regarding transfer of food security knowledge, nine group discussions were held, one with each group. This was done to collect data which would have been less available without an interaction between the members of a group.

Group discussions are crucial to find out group characteristics and analyse which interaction takes place between the members. Furthermore, it should motivate the group members to reflect about their own food security behaviour and the behaviour of other group members. Group discussions can be used to reduce inhibitions of participants to speak out their opinion. They do not only answer to the questions of the researcher, but also ask questions. Through interaction attitude manifests, this is not necessarily a result from input from outside (Atteslander, 2008). The analysis of the interaction between the farmers aims to get a better understanding of the complexity of food security behaviour within groups. A seasonal calendar, which actively involves farmers, was applied to gather data about the stability within the groups. Both male and female farmers participated in group discussions.

4.4.2. Structured interviews

As interview strategy a structured interview, as described by Bernard et al. (2010), was chosen. It aims at exposing respondents to identical stimuli under similar conditions (Bernard, 2006). The interviews were based on a questionnaire and were conducted face to face. The questionnaire for the individual interviews was partly standardised, as described in Atteslander (2008).

Rating scales were used in the questionnaire to categorise self-assessments of farmers and to measure attitudes and opinions of people, as appropriate according to Götze et al. (2002) and Mayer (2008). This mainly aims at getting information about changes of the attitude, knowledge, behaviour and the situation of F2M farmers regarding food security. The research should reflect the attitudes and indicate the level of knowledge about it. F2M group and control group informants were asked on a 5 point scale about their attitudes, from 'strongly disagree', 'disagree', 'undecided', 'agree' to 'strongly agree', and about their level of knowledge from 'very low', 'low', 'okay', 'high' to 'very high'.

The questionnaire used in this study contains open-ended questions, as described in Atteslander (2008), mainly to reveal challenges and constraints regarding food security. The individual interviews were conducted only with female farmers due to their better insight into the household food security situation.

Pretesting

Pretesting is crucial for any survey to reduce the risk of forgetting important facts which might endanger the right result of the survey. Ambiguity and problems in understanding can be cleared up and adapted to a common wording. The pre-test is to be made under conditions of the real survey. According to Bernard (2006), this minimises the risk of errors and shows the weaknesses of the questionnaires. Therefore, the questionnaire of this study has been improved and adapted after pre-testing the questionnaire beforehand with a F2M farmer living in the study area.

4.4.3. Observations

Observations made during the whole research activities (group discussions, interviews, visits, etc.) were used to verify and interpret the gathered data. Although this is not a key method, observation is important to get tacit information, which is essential to become more sensitive to the behaviour of the farmers. For this reason, these non-participant observations are recorded as field notes and complete quantitative data for further interpretations. This is important for the fieldwork and for collecting both qualitative and quantitative data in a systematic way (Bernard, 2006).

4.4.4. Feedback

After collecting the data required, written feedback, summarising key results for each group, was prepared. In the following, nine feedback meetings with the members of each group were held and key results were presented. These meetings were of immense importance for both the farmers and the study. Crucial points were reflected and discussed together and outstanding points clarified.

4.5. Data storage and management

To meet the requirements of standardisation, all interviews, group discussions and observations executed for this research study were carried out by the same person at all times. Before the field work started a field work guide was developed which defines the precise use of tools in the

field. This ensures a higher level of homogeneity. The information gathered during group discussions and individual interviews was noted. Observations, experiences and thoughts appearing during the research work were recorded in a research diary. This information should support and complement the descriptive data and is used to complement interpretations.

4.6. Data analysis

During the field work both quantitative and qualitative data have been collected. Acquired data were entered into SPSS (Statistical Package for the Social Sciences). Quantitative data were analysed using descriptive statistics. In case rating scales are equidistant, correlations were calculated by Spearman-Rho (r_s); if ordinal by Kendall Tau b (τ) (Gravetter et al., 2009; Götze et al., 2002). P-values in the brackets mark the likelihood of a correlation. Significant correlations are marked with one asterisk (*), highly significant correlations with two asterisks (**). Qualitative data were collected mainly during group discussions and complement the numerical findings gained through individual interviews. Usage of in-depth qualitative data gained during group discussions will be indicated accordingly in the results.

4.7. Technical equipment

To store and process the gained data a notebook, Acer AS 1410, with SPSS and MS Office was used with an external hard drive for backups. The interviews and the group discussions were noted in writing.

5. Results and Discussion

This chapter is divided mainly into three parts. Firstly, the food security situation is analysed; secondly, the changes of food security behaviour in particular with special regard to attitude and knowledge changes are examined. Finally, further circumstances, such as demography and constraints to food security are investigated. The analysis results from individual interviews and group discussions carried out during field work and compare the situation of the project group (F2M group) with the control group.

5.1. Food security situation

Q1: What is the current food security situation and how has it changed during the last 5 years?

Q1.1: How is the overall food security situation and how has it changed?

Q1.2: How is the situation based on food security dimensions and how has it changed?

5.1.1. Overall changes

This chapter provides an overview about the changes that have occurred during the last five years regarding the food security situation on household and on group level.

Meaning of the term 'food security'

To evaluate food security, the understanding of farmers regarding the term is crucial. For the farmers asked (n=60, 100%) food security mainly means 'to be with enough food (for home consumption)' and 'not to be with famine' (78.3 %, 47 statements) and is often (21.7 %, 13 statements) associated with special crops such as cassava (*Manihot esculenta*), millet (*Panicum miliaceum*), rice (*Oryza sativa*), matooke (*Musa paradisiaca*), sweet potato (*Ipomoea batatas*), beans (*Vicia faba*) and maize (*Zea mays*). According to 38.3 % of the farmers (23 statements) food security means 'to be healthy' and 'to eat 3 meals per day'. Less often food security was associated with having enough available income (8.3 %, 5 statements), to be able to save money (3.3 %, 2 statements) or to eat a variety of food (3.3 %, 2 statements). Looking after food crops properly to get high yields, working hard and to store food are further views of the farmers interviewed. According to one farmer food security means to 'be with development at home'. Group discussions as well as individual interviews furthermore revealed the aspect that food security means 'to get satisfied' and 'not to be with worries'. Food security is always related to the situation of the whole family. According to the farmers, in case they are not food secure, fear

about having not enough to eat for the family guides the daily life. Regarding the understanding there are only slight differences between the two sample units. To summarise, one can say the understanding of the term 'food security' mainly refers to the dimension of food availability, more than to access or utilisation of food.

Self-perception of current situation

Figure 1 illustrates how the self-assessment of the current food security situation of the two sample units differs. The statements refer to the households of the farmers. According to the data, gathered through individual interviews, 67.5 % (27 statements) of the farmers of the project group (n=40) consider themselves as food secure, at least 32.5 % (13 statements) as partly food secure. Therefore, currently no farmer of the project group feels food insecure. 40 % (8 statements) of the farmers of the control group (n=20) assess themselves as food insecure. The remaining farmers of the control group feel food secure (35 %, 7 statements) or at least partly food secure (25 %, 5 statements). To understand these differences we have to look at changes and different developments that have occurred during the last 5 years.

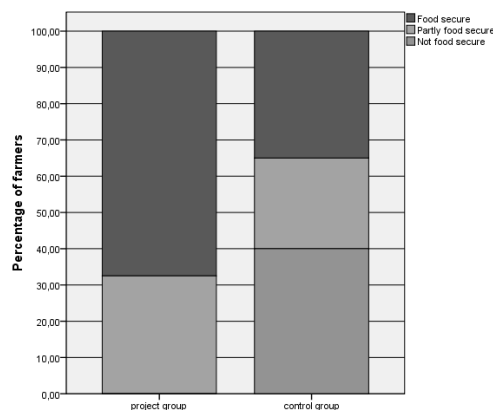


Figure 1: Self-assessment of the current food security situation

Changes of the food security situation

To get an insight into the developments and changes that have happened during the last few years, the changes during the last 5 years were examined. Figure 2 illustrates the average situation of the two sample units now and 5 years ago. The situation of the project group and the control group was nearly on the same level at the reference point and indicates an 'okay' situation. As the figure illustrates, the project group reached a 'good' situation on average, the control group an improved 'okay' situation on average.

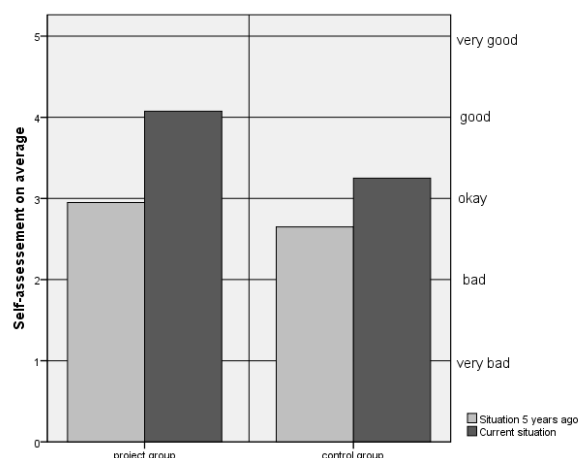


Figure 2: Current food security situation compared to 5 years ago
(on a scale from very bad to very good)

Also, the distribution of statements about the food security situation differs (see Figure 32 in Appendix A). Five years ago 35 per cent of the farmers of the project group (n=40) were in a 'bad' (22.5 %, 9 statements) or 'very bad' (12.5 %, 5 statements) situation, nowadays all farmers have an 'okay' (30 %, 12 statements), 'good' (32.5 %, 13 statements) or 'very good' situation (37.5 %, 15 statements). Five years ago 50 % of the control group (n=20) were in a 'bad' (20 %, 4 statements) or 'very bad' (30 %, 6 statements) condition, the rest in an 'okay' (20 %, 4 statements), 'good' (15 %, 3 statements) or 'very good' situation (15 %, 3 statements). Nowadays there are still 40 % (8 statements) in a 'bad' situation, 15 % (3 statements) have an 'okay', 25 % (5 statements) a 'good' and 20 % (4 statements) a 'very good' situation.

Data gained about the change of self-assessment correlate highly significantly with changes of the situation regarding availability (in terms of yields), access (in terms of income) and utilisation (in terms of quality).

Reasons for different developments

Knowledge through trainings by different organisations, such as the F2M project (carried out by CIAT and A2N), NARO, NAADS, HODIFA and HCP, was indicated as the most important reason for a changed situation within the project group. Working harder, increased acreage and trainings by NAADS were indicated as the most important reasons in the control group. In chapter '5.2 Change of food security behaviour through attitude and knowledge', essential behaviour changes and the role of attitude and knowledge regarding food security will be analysed in more detail. In chapter '5.3 The wider picture', different circumstances, such as demography and various constraints to food security, will be investigated.

High and low performers – Dimension of change

There are different developments within the sample units with regard to food security. There are high performers and low performers within both sample units. Performance indicates the change of self-assessment of the overall food security situation. The performance does not only depend on the behaviour of the farmers, but also on external circumstances, on which farmers have no influence. These circumstances will be investigated in chapter '5.3 The wider picture'.

Differences between **high performers** and **low performers** will be examined in the analysis. High performers describe farmers who have improved their situation according to their self-assessment. Low performers describe farmers whose situations stagnated or worsened according to their self-assessment. To distinguish between these two categories it is helpful to illustrate differences and reasons for developments.

Distribution within the sample units

Within the project group (n=40) there are 70 % (28 farmers) high performers and 30 % (12 farmers) low performers, which means that their situation is still the same as 5 years ago or worse. Within the control group the share of high performers amounts to 65 % (13 farmers); the share of low performers to 35 % (7 farmers).

Dimension of average change

There is a difference in the dimension of the average change. The high performers of the project group could improve their situation from a 'bad' to an improved 'good' situation, the control group from a 'bad' to an 'okay' situation on average. Low performers of the project group decreased from a 'good' situation to a situation between 'okay' and 'good' and within the control group the average declined from a 'good' to an 'okay' situation (see Figure 33 in Appendix A).

Reasons for these different developments will be investigated in chapters '5.2 Change of food security behaviour through attitude and knowledge' and '5.3 The wider picture'.

Times of food shortage

The incidence of food shortage and times of hunger illustrate the differences between the two sample units additionally. Figure 3 shows, while 75 % (15 statements) of the control group (n=20, 100 %) experienced hunger at least one time during the last five years, in the project group (n=40, 100 %) 50 % (20 statements) of the interviewed farmers experienced food shortage in the same period of time. Food shortages within the project group last mostly two (8 statements) or one month (5 statements), up to three (2 statements) or four months (3

statements). One farmer started that she is with famine once a year from January until April. The other farmers of the project group indicated one date. This is similar in the control group. If they indicated that there was food shortage it mostly lasted two months (8 statements), sometimes one (2 statements) or three months (one statement).

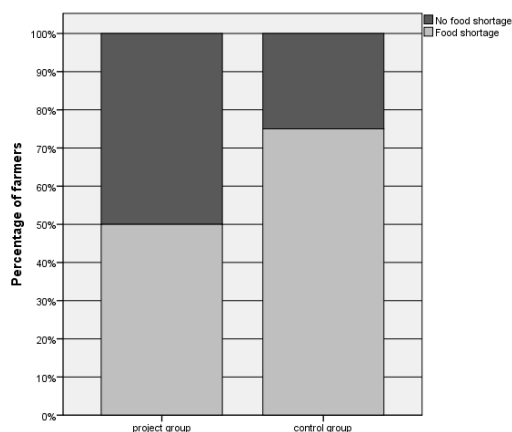


Figure 3: Percentage of farmers that experienced times of food shortage over the last 5 years

According to the farmers, weather changes, sickness, pests, diseases and further external circumstances were causing food shortages during the last 5 years (for more detailed analysis see chapter '5.3.3 Constraints to food security').

Changes of food security situation for children

A further aspect is the food security situation of children. In every household of the project group the woman asked has to care for 4.5 children on average, in the control group for 3.4 children. Considering these figures, we have to take into account that farmers with an age from 18 to 82 years were interviewed, and therefore both very young and very old female farmers are included in this average. The children are, according to the farmers asked in the group discussion, highly affected by food security changes. Most vulnerable are children at the age below five: Lack of food is particularly harmful.

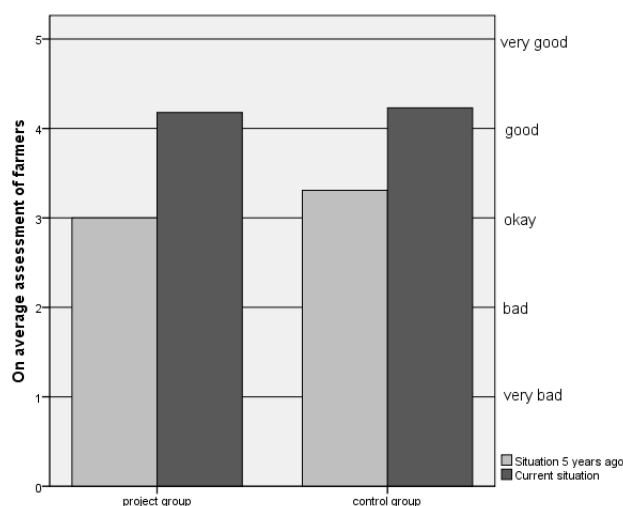


Figure 4: Food security situation of children below 5
(on a scale from very bad to very good)

The female farmers assessed the situation of the children below five living in their households. Data was collected in households with children below five. In nearly seventy per cent (68.3 %) of the households asked (n=60, 100%) there are children below five. These 41 households (28 from the project group; 13 from the control group) are included in the results of this chapter. In these households there are on average 2.07 (project group) or 1.62 (control group) children below five.

Figure 4 shows similar results between the two sample units. The farmers of the project group (n=28) indicated on average, that the situation of their children below five was 'okay' on average five years ago and has changed into a 'good' situation now. The situation of the farmers of the control group (n=13) is similar.

In the project group in 10.7 % (3 statements) of the cases there was a decrease of the situation of the children below 5. In the control group there was a decrease in 15.4 % (2 statements) of the households asked. In general, there is a clear improvement of the situation of children below five in the project group, as well as in the control group.

According to the farmers of the project group, this is because they now have enough food to give children a balanced diet. As a further reason for improved child nutrition, knowledge change of both sample units can be seen. Like Figure 5 illustrates that both sample units could improve the level of knowledge about nutritional needs of children. In the project group there was a slightly stronger improvement.

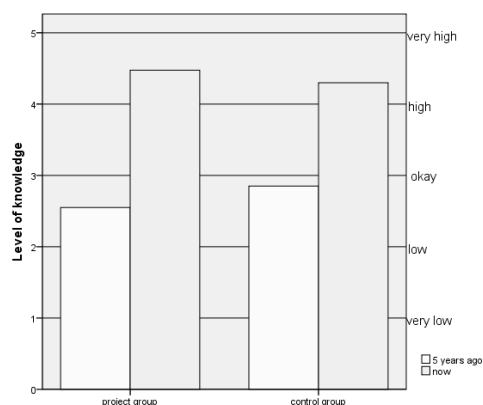


Figure 5: Level of knowledge about nutritional needs of children
(on a scale from very low to very high)

The project group mostly indicated trainings in child nutrition by HCP, the F2M project (carried out by A2N and CIAT), NARO and NAADS as source of knowledge, whereas the control group indicated radio and the hospital as their main source. Some also had trainings from NAADS.

The situation of children below five is similar within the two sample units although there is a significant difference between the project and the control group in the overall food security situation. Reasons can be that, due to fewer children of farmers of the control group, on average an improvement, similar to the project group, was possible. In group discussions female farmers of the control group indicated to be focussing on child nutrition and setting aside own nutritional needs to ensure a balanced diet for their children.

5.1.2. Summary & Discussion – Overall changes

- **Meaning of food security – Lack of awareness about dimension of access and utilisation**

Food security is mainly associated with the dimension of availability of food. Income is not commonly associated with food security in both groups (dimension of access). Food security is mainly understood as the ability to be self-sufficient. But availability does not say anything about intra-household distribution and nutrition (Pinstrup-Andersen, 2009). Aspects of utilisation are not actively associated with the term food security for farmers asked in both groups, although farmers are for example aware of the connection between balanced diets and health. But also non-food factors, such as health care, are decisive for a good food security situation (Pinstrup-

Andersen, 2009). Farmers of both groups are not actively aware that these aspects are part of food security, but know about the importance of these aspects for their livelihood.

- **Project groups strongly improved food security through F2M**

Results showed that F2M farmers experienced food shortages less often than farmers of the control group. Through organic agriculture farmers are in a better position to cope with food shortages, according to Bachmann et al. (2007). No farmer of the project group is currently, according to their self-assessment, in a 'very bad' or even 'bad' situation. In the control group there are still 50 % of the farmers in a 'bad' or 'very bad' situation. Results showed that F2M farmers could strongly improve their food security situation during the last 5 years. First observations showed the importance of trainings carried out by the F2M project and partly other organisations. Due to the fact that control groups developed to a lower degree, it can be assumed that trainings by the F2M project contributed to a high extent. Which differences in behaviour between the two sample units triggered the different development will be investigated in chapter '5.2 Change of food security behaviour through attitude and knowledge'.

- **Improved child nutrition through knowledge from different sources**

Food insecurity can occur within households despite the availability and accessibility of food, if knowledge about appropriate feeding practices is not available (Walaga & Hauser, 2005). Both sample units showed that they could improve the food security situation of their children through improved knowledge about child nutrition. The source of knowledge differs (reach from radio, hospital to different NGOs), but the emphasis on proper nutrition for children increased in both groups during the last 5 years. The stronger emphasis originates from trainings by different organisations and partly by the F2M project. Especially children are affected by a lack of appropriate nutrition (Benson, 2004). Therefore, female farmers prioritise child nutrition and try to ensure food security first of all for the children. Previous studies revealed that there is strong evidence that dietary diversity is positively associated with child nutritional status (Roos, 2006). Therefore, improvements of the overall food security situation and improvements in dietary diversity (see chapter 5.2.5 Utilisation) triggered by the F2M project have a positive influence on child nutrition.

5.1.3. Specific changes – Food security dimensions

This chapter aims to give a brief overview about developments that happened during the last 5 years and illustrates changes of the situation along the four dimensions of food security, namely availability, access, utilisation and stability.

Availability - Yields

Availability of food is analysed by the increase of yields during the last 5 years. In chapter '5.2 Change of food security behaviour through attitude and knowledge', behavioural factors influencing availability of food, such as land use, storage etc. will be examined. Changes of yields perceived by farmers significantly correlate with changes of the overall food security situation ($r_s=0.350^{**}$, $p=0.003$).

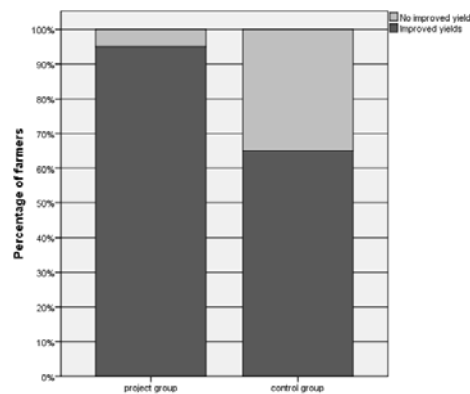


Figure 6: Percentage of farmers that increased their yields over the last 5 years

Asked if farmers could improve their yields during the last years, we can realise a significant difference between the two sample units, as Figure 6 illustrates. 95 % (38 statements) of the project group ($n=40$, 100%) could improve their yields. This is, according to the farmers, mainly due to improved farming methods. 5 % (2 statements) could not improve the quantity of their harvest. These farmers mainly indicated problems with the weather, such as the change of season and drought, or too little money to invest in agriculture (see chapter 5.3.3 Constraints to food security). 65 % (13 statements) of farmers of the control group ($n=20$, 100%) improved their yields; 35 % did not. These farmers mainly indicated that their yields increased due to more acreage and better cultivation. A decrease was due to drought and changes of the season, according to the farmers.

Increased yields highly correlate ($r_s=0.517^{**}$, $p=0.000$) with improvements of the quality of food (in terms of crops that are high-yielding, tasting better and more resistant). A reason for the

stronger improvement of the project group as compared to the control group can be a better access to improved seeds. In addition, the project group got trainings in natural resource management by the F2M project (carried out by A2N) and gained knowledge about improved farming methods, as elucidated in chapter '5.2 Change of food security behaviour through attitude and knowledge'.

Access - Income

A crucial indicator for the access to markets is income. Changes of the income situation correlate highly significantly with changes of the overall food security situation ($r_s=0.573^{**}$, $p=0.000$). Increased yields ($r_s=0.242^*$, $p=0.031$) and even more an improved quality of food ($r_s=0.375^{**}$, $p=0.002$) are linked to an improved income.

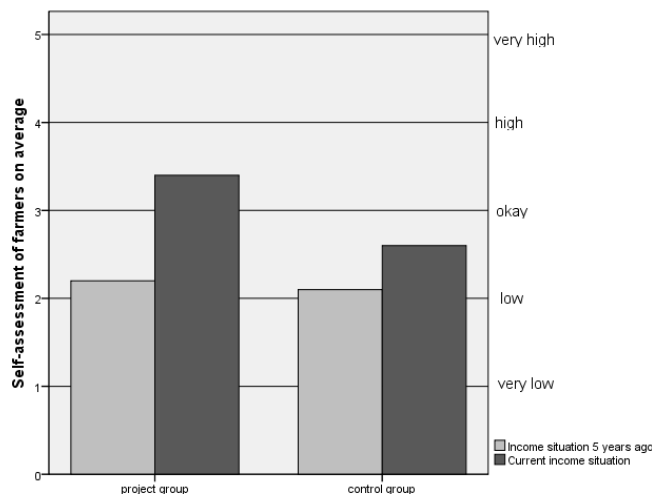


Figure 7: Change of income over the last 5 years

(Self-assessment of income situation on a scale from very low to very high)

Figure 7 shows that the two sample units had a similar income level 5 years ago. Farmers of the project group improved on average up to a level between 'okay' and 'high'. The control group improved the income situation on average up to a level between 'low' and 'okay'. 12.5 % (5 statements) of the farmers of the project group ($n=40$, 100%) experienced a decrease of the income, in the control group ($n=10$, 100 %) this was the case for 25 % (5 statements) of the farmers.

Reasons for decreased income

In case there is a decrease this is, according to the farmers, due to different reasons. One farmer of the project group indicated that she now grows more food crops and fewer cash crops to increase self-sufficiency. Fewer livestock, pests, and personal problems are further important reasons within the project group for a decline of income.

Within the control group the farmers indicated that higher age, giving up additional businesses, paying more school fees, fewer land, and personal problems were reasons for the negative change.

Reasons for rising income

The groups indicated that the improved income situation is through increased yields triggered by improved seeds from different organisations and knowledge about improved farming methods mainly from A2N. Due to this, yields increased and therefore more harvest could be sold.

As revealed in the group discussions a further reason for the changed income situation of the project group is the changed perspective on the markets. The F2M groups learnt to do market surveys, including the collection of information about potential markets, to find marketable crops which achieve better prices. Through experimentations the crops are tested for their suitability on the soils. F2M farmers do not only sell surplus production, but cultivate focused on special cash crops and sell these products together in the group (collective marketing) within special agro-enterprises. Group discussions revealed that due to collective marketing F2M farmers could improve their income.

Utilisation – Quality of food

Important for the dimension of utilisation is the quality of food. Therefore, we analyse this aspect, and if there are differences between the control and the project group. There is a highly significant correlation ($r_s=0.348^{**}$, $p= 0.003$) between the improvement of the quality of food and the overall change of the food security situation. Improved quality of food, in addition, correlates with an improvement of income ($r_s=0.375^{**}$, $p=0.002$) through the increase of yields.

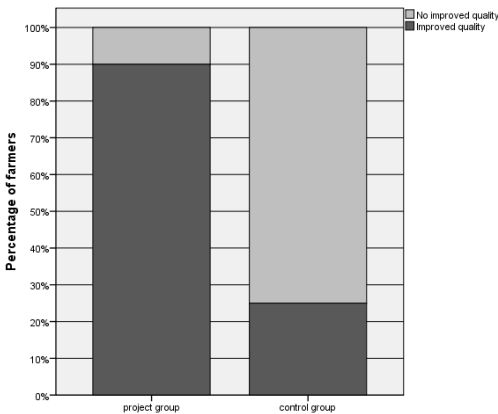


Figure 8: Percentage of farmers that improved the food quality over the last 5 years (Self-assessment of farmers on a scale from very low to very high)

Figure 8 shows that there is a significant difference between the groups. For 90 % (36 statements) of the F2M-farmers there is an improvement of the quality of the food. For 25 % of the control group there was an improvement of the quality of the food; for the remaining 75 % there was no improvement.

The individual interviews revealed that the improvement within the project group is due to improved seeds and new varieties from different organisations – mainly from the F2M project (through A2N) but also from NARO, NAADS and HCP – and training on improved farming methods. They furthermore learnt by the F2M project (carried out by A2N) to carry out experimentations, to find suitable varieties for their soils and to have different varieties. According to the farmers, the new varieties are either high-yielding, have a better taste, are looking better or are more resistant against pests, diseases and drought. If the soils are not appropriate, the crops become bitter.

Farmers of the control group who improved the quality of food indicated that NAADS brought them improved seeds. Farmers who could not improve their yields indicated that better seeds and knowledge about improved farming methods would be essential to improve their food security situation in the future.

Stability – Food availability calendar

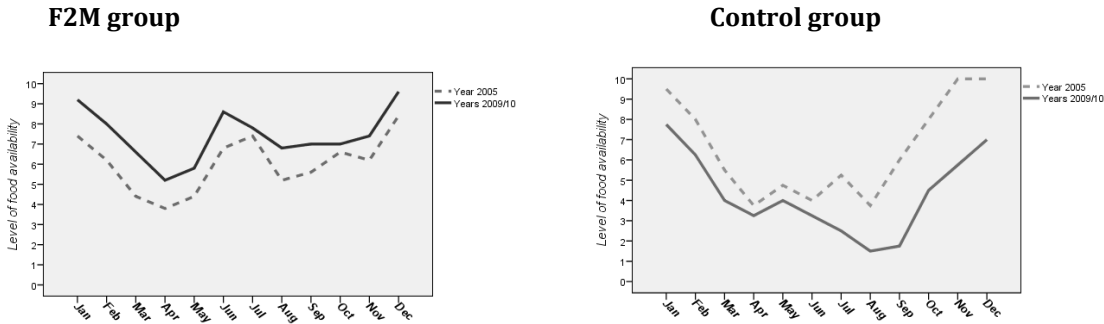


Figure 9: Food availability calendars of F2M group and control group (on a scale from 1=food insecure to 10=food secure)

Groups discussions revealed, as we can see in Figure 9, that on average there is a significant difference between the F2M groups (5 groups) and the control groups (4 groups) in the availability of food. The figures indicate the food availability at group level on a scale from 1-10, where 1 means that no food is available up to 10, which means 'total food security'. The dashed line illustrates the situation throughout the year 2005; the solid line shows the situation from January to December summarised for the years 2009 and 2010.

The figures clearly illustrate that there is on average an improvement of the situation of the project group during the last 5 years. There are fluctuations, as the figures show, due to the different seasons. During planting seasons there is less food, whereas during harvest seasons there is enough food available.

On average, there is a stable situation for the project group. Nevertheless, there is one project group facing food security problems due to crop shortfalls caused by excessive rainfall and drought.

Within the control group there was a decrease of the average situation during the last 5 years. The lines show that there are strong fluctuations during the year. Within the years 2009/2010 mainly in March/April and August/September (i.e. during planting season) there is too little food, due to low yields and less storage. Weather fluctuations are the main reason for the destabilisation of the food security situation for the farmers of the control group.

The situation of the control groups declined, according to the farmers during group discussions, due to heavy rain falls, drought and the shift of season. Additionally, the need of income for education is in conflict with food security demands. Low prices on the markets exacerbate the problem. One control group described their situation as follows:

'When we harvest we sell our products to get money to pay school fees. Due to low prices on the markets we don't make enough profit to pay all fees. Overall we do not have enough food left to feed our kids.'

Also, other group discussions with control groups verified this and farmers indicated the same challenge.

As previous chapters have shown, there are changes in yields, income and quality of food. The different dimension of changes in the two sample units causes to a high degree the different developments. Additionally to, or complementing the lack of appropriate planting material, the low capacity to adapt to weather fluctuations and insufficient storage are constraints for the control group.

5.1.4. Summary & Discussion – Specific changes

- **Availability: Farmers improved yields – High contribution of F2M project**

Most farmers of the project group could improve their yields during the last 5 years. Different studies (Beban, 2009; Scialabba, 2007; Gibbon & Bolwig, 2007; Clay, et al., 1995) revealed that yields increased through the conversion to organic agriculture. The F2M project contributed to

the increase to a high degree by giving farmers improved seeds and training on improved (organic) farming methods. Data revealed that there are various constraints, such as weather conditions, pests and diseases, hindering increasing yields.

- **Access: Highly significant increase in income through F2M**

Through conversion to organic agriculture income can rise significantly (Beban, 2009; Bolwig et al., 2007; UNEP-UNCTAD, 2008). Farmers of the F2M project could raise their income to a much higher degree than farmers of the control group. This is mainly due to activities within the F2M project regarding markets but also, as data showed, due to better seeds and improved (organic) farming methods learnt by the F2M project. Access to food markets and other crucial spending is possible through more income.

- **Utilisation: Improved quality of food through better seeds and trainings by F2M**

Household food security is strongly related to the quality of food (Callens & Seiffert, 2003). Through the F2M project farmers got access to better varieties and experimented to find suitable crops for their soils. Therefore, the quality of food could be improved to a high degree within the project group. There is a significant impact of the type of farming method on the quality of food available within the household (Walaga & Hauser, 2005). Knowledge about sustainable agricultural practices by the F2M project encouraged farmers to improve their farming methods. Also other organisations, such as NAADS, contributed by giving farmers improved seeds. Seeds alone are, nevertheless, not enough to improve the quality of food and overall food security.

- **Stability: Improved stability through F2M project**

Household food security deals with the question of how household members produce or acquire food throughout the year, for example how they store food to overcome seasonal shortages (Callens & Seiffert, 2003). The seasonal calendar and other data gathered during group discussions revealed significant differences between the two sample units in the stability of food security and showed slight differences between the groups within the sample units. Overall, the food security situation of the project groups is stable, according to group discussions, and increased during the last 5 years. Previous studies underlined the potential of organic agriculture to improve the ability of farmers, for example to withstand drought (Bachmann et al., 2007) and therefore ensure stability. Nevertheless, one project group indicated to still have food security problems due to excessive rainfall and drought. Also, other F2M groups are still facing constraints to food security (see chapter 5.3.3 Constraints to food security).

The food security situation of farmers of the control group is challenging and decreased during the last 5 years. Reasons are the lack of appropriate planting material, low capacity to adapt to weather fluctuations, less storage quantities and no sufficient source of income. As according to Pinstrup-Andersen (2009), food acquisition is not prioritised over the acquisition of other goods and services such as school fees, if there is not enough for both demands. Group discussions verified this and revealed that farmers of the control groups are often forced to use income to pay school fees, which causes food insecurity.

F2M groups managed to fulfil the two basic needs (food and education) by increasing yields through applying better farming methods and improving income through collective marketing. Both results of group discussions and individual interviews revealed that farmers gained this knowledge mainly through the F2M project. Therefore, an immense contribution of the F2M project to the improved stability of food security throughout the year within the project group can be verified.

5.2. Change of food security behaviour through attitude and knowledge

Q2: What is the current food security behaviour (based on food security dimensions) and how has it changed during the last 5 years?

Q2.1: How has the attitude regarding food security influenced behaviour?

Q2.2: How has knowledge about food security influenced behaviour?

To analyse the change of food security behaviour (in the dimension of availability, access, utilisation and stability) certain indicators were selected. The integrated model of behaviour change is deduced from literature and was adapted in the preparing stage of the research. It contains attitude and knowledge as triggers of behaviour change.

In the following chapters 'Availability' and 'Access', farmers who lived with their parents 5 years ago are excluded from the sample unit, because they did not produce or purchase anything at that time. This approach was chosen because the lack of comparison values of these farmers could distort the results.

5.2.1. Availability

Use of land for food crops

Figure 10 shows the behaviour regarding the use of available land. Within the project group (n=39) the share of land used to grow food crops has stagnated on average for the last 5 years and currently amounts to about 58.5 % of total land. Within the control group (n=17) the share of land used for food crops decreased from 74.7 % to 55.3 % on average.

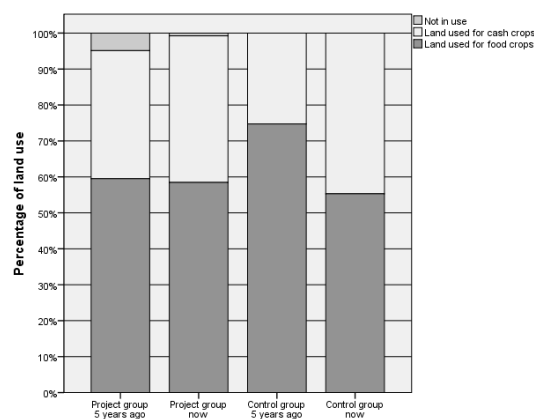


Figure 10: Land use – Food crops vs. cash crops

Within the project group there is a difference between **high and low performers** (see Figure 34 in Appendix A). The high performers of the project group (n=27) increased the share of land used for food crops by about 2.6 % on average during the last 5 years. The low performers (n=12) decreased the share of land for food crops by about 9.2 % in the same period of time. Within high (n=12) and low performers (n=5) of the control group there is no big difference in the change of land use. The share of land for food crops decreased by about 19.2 % (high performers) and 20 % (low performers) on average.

Balancing between food and cash crops

Group discussions revealed that the changed market orientation of F2M farmers, as elucidated in chapter '5.1.3 Specific changes – Food security dimensions: Income', does not harm the efforts of farmers to cultivate food crops for home consumption. The farmers try to balance between food and cash crops because they learnt about the importance of balancing in trainings.

The groups established *rules regarding food security*. One project group made plans for cultivation, in which every farmer has a detailed plan of what to grow. According to the farmers, this encourages each group member to plant enough food crops, and helps each other to improve. The other four project groups have also defined rules regarding food security, for example, each member has to plant 40 by 40 yards for cassava for food security purposes. In addition, one group determined that the group members are not allowed to sell products from their garden if they have food security problems. In this case, the farmer has to inform the group beforehand. Droughts, pests and diseases and too little land could hinder fulfilling the rules, according to the project groups.

Within the control group, farmers are often forced to sell parts of their harvest needed for home consumption because of school fees. This reduces the capability of control groups to balance between food and cash crops. Two control groups have established the rule 40 by 40 yards for cassava and 20 by 20 yards for beans. Two control groups plan to establish such rules.

Degree of self-sufficiency

In the following, the change in the degree of self-sufficiency with food, and of how behaviour regarding production influences the food security situation is analysed.

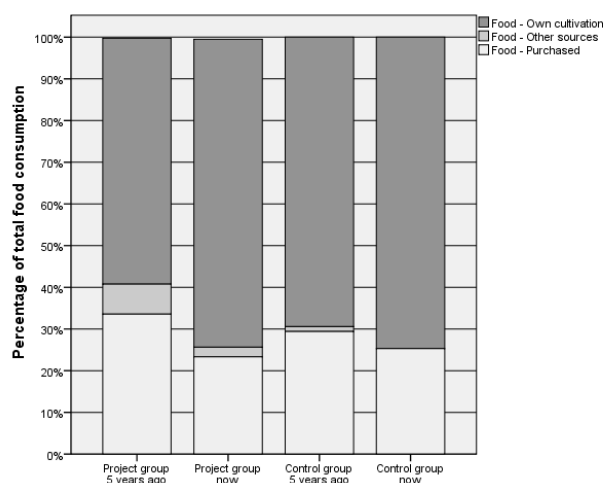


Figure 11: Degree of self-sufficiency – Average proportion of food consumption of households

Figure 11 shows that in the project group (n=39) the average share of self-sufficiency increased from 59 % to 73.9 % of total food consumption. Within the control group (n=17) the share of self-sufficiency increased from 69.4 % up to 74.7 % on average.

There is a difference in the change between **low and high performers** (see Figure 35 in Appendix A). Within the high performers of the project group (n=27) the share of food from own cultivation increased by about 20 % on average, within the low performers (n=12) by about 3.3 %. The share of food from own cultivation increased by about 6.7 % within the high performers (n=12), within the low performers (n=5) by about 2 % on average.

Data show that within the project group, in case income increased during the last 5 years, the share of land used for food crops decreased ($r_s=-0.318^*$, $p=0.024$), the share of food from own production, however, increased ($r_s=0.284^*$, $p=0.040$). This may result from an increasing productivity within the project group. Through increased yields it is possible to produce more on a lower share of land.

Effects on food security situation

Observing both sample units together, there is a significant positive correlation of the current food security situation with a higher share of food from own cultivation ($r_s=0.262^*$, $p=0.026$). A similar observation can be made looking at the change during the last 5 years. If the share of the food from own cultivation increased during the last 5 years, the overall food security situation increased as well in the same period of time ($r_s=0.342^{**}$, $p=0.005$).

Decision-making pattern – Cultivation

Figure 12 is depicting the decision-making pattern within the household regarding cultivation. The female farmers were questioned as to who is deciding within the household what to grow on the field. In this case, 'man' is either a husband or a father living in the household.

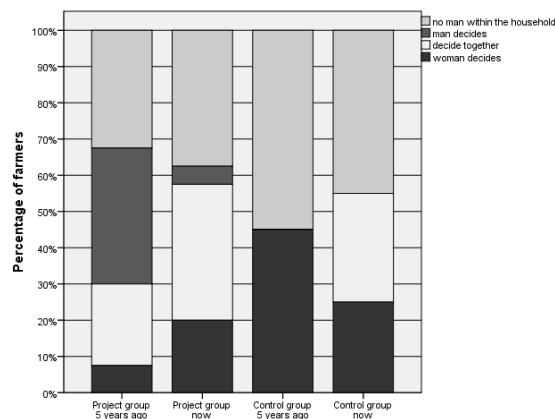


Figure 12: Decision-making pattern about cultivation

In the project group (n=40, 100%) the share of women deciding alone about the cultivation increased from 7.5 % (3 statement) up to 20 % (8 statements), although there is a man living in the household. Also, the share of households where man and woman decide together increased from 22 % (9 statements) up to 37.5 % (15 statements). On the other hand, the percentage of households where the man decides alone decreased from 37.5 % (15 statements) to 5 % (2 statements).

Within the control group (n=20, 100 %) there was a totally different starting point. There were only households without a man (55 %, 11 statements), or where the woman decided alone (45 %, 9 statements). Now there are also households where man and woman decide together (30 %, 6 statements), and where the share of woman without man decreased (45 %, 9 statements). These women got married and now decide together with their husband.

Although this shows a strong development there are still certain problems. One female farmer of the control group described her situation as follows:

'My husband produces cash crops on our land. He is using the income. Nothing is left for the family. Therefore I grow food crops on a foreign land to ensure that our children have something to eat.'

Farmers of the project group got trainings in gender relations by the F2M project (carried out by A2N). Through gained knowledge about improved farming methods, the female farmers have more competence to decide and therefore, according to a female farmer, got power to decide.

Attitude and Knowledge

Attitude regarding importance of food security

Asked about if farmers are regularly thinking actively about how to improve their food security situation (in the following named 'Importance of food security'), it turned out that the level of agreement on average increased during the last five years (see Figure 13). In the project as well as in the control group the level of agreement increased from 'disagree-undecided' to 'agree-strongly agree', questioned if they are regularly thinking about how to improve their food security situation.

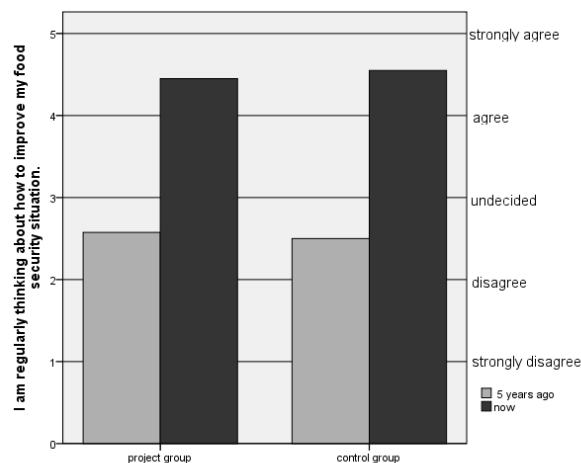


Figure 13: Importance of food security – Frequency of thinking about improving food security

The farmers of the project group (n=40) mainly indicated that training on improved (organic) farming by the F2M project (carried out by A2N and CIAT), NARO, NAADS, HODIFA HCP and FAL was essential for the changed attitude. Further statements revealed that through group formation, increased family size and weather changes the importance changed.

Within the control group (n=20) the farmers mainly indicated as reason for a changed way of thinking, that they are working hard now. 2 farmers also received trainings by NAADS and NARO, and some also stated that an increase in family size, the change of season, drought and times of famine changed their mind.

Effects on food security behaviour

Looking at the attitude regarding the level of agreement when asked about the frequency of thinking about how to improve the food security situation, we realise that, within the project

group, it has an impact on the behaviour regarding what to grow on the land. The more the farmers agreed that they are actively thinking about how to improve their food security situation, the more they are using land to grow food crops ($r_s=0.304^*$, $p=0.030$). This shows that a more active thinking about food security leads to a changed behaviour. Within the control group there is no correlation in this direction.

Effects on food security situation

Considering directly the interdependency between the change of attitude of importance of food security and the change of the food security situation, there is a significant correlation within the project group ($r_s=0.334^*$, $p=0.019$). Considering the control group alone there is no such correlation.

Knowledge about improved farming methods

Figure 14 shows that the perceived level of knowledge about farming methods of the farmers changed both in the project, as well as in the control group. The level increased within the project group from low to between 'high and very high'; within the control group from between 'low and okay' to a 'high' level of knowledge about improved farming methods.

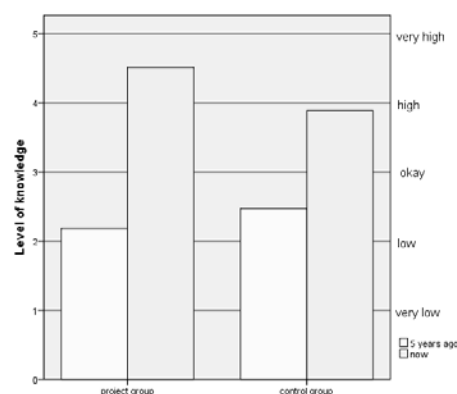


Figure 14: Level of knowledge about improved farming methods
(on a scale from very low to very high)

The farmers of the project group indicated that they got trainings by the F2M project (carried out by CIAT and A2N), NARO, NAADS, HODIFA, HCP and World Vision about improved farming methods. The farmers of the project group partly received trainings by NAADS, HCP and UNDP.

According to the farmers of the project group ($n=39$) they learnt to plant in lines, to take care of proper spacing, to use (organic) manure to increase yields, how to make compost, to plant in time, to apply soil management, such as controlling and maintaining soil fertility and soil conservation, environmental protection, to make drainage, to weed and harvest in time, to use

mulch, not to burn grass, to consider intercropping and crop rotation, to carry out research on pests and diseases, and how to control pests in an organic way. The F2M farmers furthermore learnt about proper weeding and to grow suitable crops, for example varieties which are more resistant against pests, diseases and drought and which are doing well on the soils.

Most of the farmers of the control group (n=17) indicated that they did not gain any new knowledge (8 statements) through trainings. Some learnt to plant in line (4 statements), to use proper spacing (1 statement) and to grow greens or other crops which are healthy (2 statements). The overall increase (see Figure 14) of the level of knowledge indicated by farmers of the control group may result from a felt increase through own experiences.

Effects on food security behaviour

Looking at the current level of knowledge about improved farming methods we can realise that in the project group a higher level of knowledge about farming methods goes hand in hand with a higher share of food from own cultivation ($r_s=0.323^*$, $p=0.022$). Within the control group there is no correlation noticeable in this regard. Nevertheless, also in the control group we can notice a connection of knowledge and behaviour. The higher the current level of knowledge regarding farming methods, the higher the share of land used to grow food crops ($r_s=0.497^*$, $p=0.021$).

Effects on food security situation

The current level of knowledge about farming methods within the project group shows a highly significant correlation with the current food security situation ($r_s= 0.446^{**}$, $p=0.002$). Within the control group no such correlation can be identified.

Interdependencies between attitude and knowledge

There is a highly significant correlation between the level of knowledge about improved farming methods and the attitude regarding the importance of food security ($r_s=0.249^{**}$, $p=0.032$) observing the whole sample unit.

5.2.2. Summary & Discussion – Availability

- **Self-sufficiency essential for food security – More emphasis on food crops by F2M farmers**

According to Bahiigwa (1999), growing not enough food is one of the main reasons for food insecurity in Uganda. Organic agriculture supports self-sufficiency of smallholder farmers, according to Sligh & Christman (2007) and as verified by the results. The degree of self-sufficiency is influencing the food security situation of farmers of both sample units to a high

degree. The results revealed that the share of own production determines both the current food security situation as well as the change of the situation during the last 5 years in both groups. F2M farmers increased the share of food from own production to a high, farmers of the control group to a lower extent. The PMA (Plan for the Modernisation of Agriculture) suggested to eradicate rural poverty and to improve household food security through markets rather than food self-sufficiency (MFPED, 2005). Within the scope of the study, however, one can assume that a higher share of self-sufficiency supports food security.

Often it is argued that through market orientation (mainly female) farmers are forced to reduce the production of food crops (Sanginga et al., 2004). Group discussions showed that F2M farmers place strong emphasis on growing food crops to ensure food security. Farmers of the control group are less capable to supply themselves, because they are forced to sell their production to gain income for education fees. The contribution of the F2M project to the positive development of farmers of the project group is high, due to awareness and knowledge raising trainings about the importance of sufficient food for home consumption.

- **Higher degree of self-sufficiency – Share of land for food crops remained the same**

The degree of self-sufficiency increased to a high extent within the project group. Nevertheless, F2M farmers did not increase the average share of land used for food crops. Improved yields, through applying knowledge about improved farming methods, were decisive for this change.

- **F2M farmers: Rising income does not hinder self-sufficiency**

Results showed that within the F2M group, although income increased during the last 5 years, the degree of self-sufficiency increased as well. Also, previous studies (Bolwig et al., 2007) showed that organic production did not reduce food production. Due to the F2M project farmers are more able to grow enough food. Results showed that it is possible to combine market orientation and food security through the F2M project. There is a higher degree of self-sufficiency and a higher income through more efficient land use. This mitigates the competition over production factors between food crops and (organic) cash crops, as also stated by a study of Bolwig et al. (2007). Technology spill-over effects through usage of organic farming methods in cash crop production to food crop production play a major role (Bolwig et al., 2007).

- **Attitude influences behaviour regarding land use of F2M farmers**

Results showed that there is a clear connection between a higher level of agreement to the importance of food security and a higher share of land used for food crops within the F2M group. The F2M project contributed to the change of attitude of farmers of the project group to a high extent. Therefore, it can be verified for the project group that the attitude is influencing

behaviour regarding food security, as well as the overall situation. This connection is not verifiable within the control group according to the data. This shows that although the importance of food security increased for farmers of the control group as well, it was not possible to translate it into behaviour change and changes of the overall food security situation. Knowledge gaps and further constraints (see chapter 5.3.3 Constraints to food security) are reasons for this.

- **Knowledge as most influencing factor for attitude and behaviour regarding availability**

An increasing level of knowledge about improved farming methods influences the attitude about the importance of food security. This was observed in the whole sample unit. Farmers of the project group could increase their level of knowledge to a higher degree than farmers of the control group. The F2M project contributed to a high degree to the improvement of knowledge about improved (organic) farming methods. The level of knowledge about farming methods correlates with the degree of self-sufficiency within the project group. And a higher degree of self-sufficiency is influencing the food security situation in a positive way.

- **Knowledge about improved farming methods influences food security situation**

Organic farming is a knowledge-based approach, where the access to knowledge is the major prerequisite (Scialabba, 2007; Sligh & Christman, 2007; UNEP-UNCTAD, 2008; Clay, et al., 1995). Results verified this statement. A higher level of knowledge about improved farming methods triggers a better food security situation within the project group. This is due to a higher degree of self-sufficiency, supported by technology spill-over effects through using improved farming practises also in food crop production (Bolwig et al., 2007). Also, within the control group knowledge is influencing behaviour. The higher the level of knowledge about improved farming methods, the more farmers of the control group are using land for food crops. Nevertheless, this does not translate into a better food security situation for farmers of the control group due to a lack of appropriate planting material, unfertile soils, weather conditions, pests and diseases.

- **Decision-making pattern: Empowerment of women through knowledge**

The results showed that women decide alone or together with their husband more often than 5 years ago. The share of households where the man decides alone decreased. Through the F2M project, female F2M farmers gained knowledge about improved farming methods. Therefore, women in the project group have the knowledge needed to decide more qualified what to grow. In addition, gender trainings within the project group are decisive for the positive development.

5.2.3. Access

Use of land for cash crops

Figure 10 (see page 47) shows the behaviour regarding the use of available land. Within the project group (n=39) the share of land to cultivate cash crops increased from 35.6 % to 40.8 % on average. Main parts of this land were not in use before. This share of land not in use decreased from 4.9 % to 0.8 % on average. The remaining share of land is not in use, because the soil is not suitable to grow crops.

Within the control group (n=17) the share of land for cash crops increased from 25.3 % up to 44.7 % on average.

Within the project group there is a difference between **high and low performers** (see Figure 34 in Appendix A). The high performers of the project group (n=27) increased the share of land for cash crops by about 3.3 %. Before, parts of this land were not in use. The low performers (n=12) increased the share of land for cash crops by about 9.2 %. Within high (n=12) and low performers (n=5) of the control group there is no big difference in the change of land use. The share of land for cash crops increased by about 19.2 % (high performers) and 20 % (low performers) on average.

Share of purchased food of household consumption

Figure 11 shows that in the project group (n=39) the share of purchased food of total food consumption decreased from 33.6 % to 23.3 % during the last 5 years. Within the control group (n=17) the share of purchased food decreased from 29.4 % to 25.3 %.

There is also a difference between **high and low performers** (see Figure 35 in Appendix A). The share of purchased food decreased by about 13.3 % within the high performers (n=27), within the low performers (n=12) by about 3.3 % within the project group. Within the control group the share of purchased food decreased by about 5 % within the high performers (n=12), within the low performers by about 2 % (n=5) on average.

Spending for household food consumption

Figure 15 shows the share of income used to buy food 5 years ago and now. There is a decrease in both sample units. The share used to buy food decreased on average from 35.4 % to 20.8 % of total income within the project group; within the control group from 27.7 % to 22.4 %.

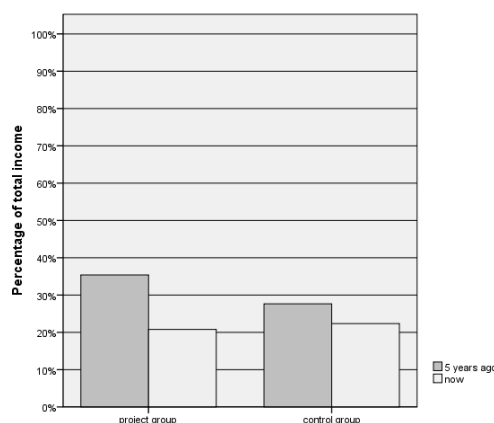


Figure 15: Percentage use of income to purchase food

There is a slight difference between **high and low performers** (see Figure 36 in Appendix A). The share of income used for food decreased within the high performers of the project group (n=27) by about 16.3 %, within the low performers (n=12) by about 10.8 %. Within the control group the figures differentiate to a smaller extent, within the high performers (n=12) there is a decrease of about 5.8 %, within the low performers of about 4 %.

Effects on food security situation

There is a highly significant negative correlation of the current food security situation and the share of bought food ($r_s = -0.289^*$, $p = 0.015$) observing the whole sample. Looking at the changes during the last 5 years, the correlations show a similar development. If the share of purchased food decreased during the last 5 years, the overall food security situation increased in the same period of time ($r_s = -0.337^{**}$, $p = 0.005$) due to a higher degree of self-sufficiency.

Effects on income situation

Within the project group there is a highly significant correlation between the change of land use and the change of income. The more a farmer changed cultivation towards growing more cash crops during the last 5 years, the more the income increased ($r_s = 0.434^{**}$, $p = 0.003$). Considering the control group there is no such correlation.

Decision making pattern – Money spending

The decision on what to spend money within the household is decisive (see Figure 43 in Appendix A). Within the project group (n=40, 100 %) 50 % (20 statements) of the female farmers indicated to decide about money spending together with the man in the household, and 5 % (2 statements) alone. In 5 % (2 statements) of the household the man decides alone. In 35 %

(7 statements) of the households of the control group (n=20, 100 %) female farmers decide together with the man; in 15 % (3 statements) the man decides alone. In no case the woman decides alone.

In both sample units the money is mainly used for education, health expenses, food, utilities for the household and to reinvest in agriculture. There is no visible difference in the purpose of the spending if the man or the woman decides.

Several female farmers of the F2M project stated that they now have their own income, independent from their husbands, and can decide alone for what to use it. These female farmers could gain this additional income through participating in the F2M-project.

Attitude and knowledge

Attitude regarding cash crops vs. food crops

Figure 16 shows that the level of agreement slightly decreased within the project group (n=39) when asked if it is more important to grow cash crops than food crops. Within the control group there is no change on average, as the figure shows.

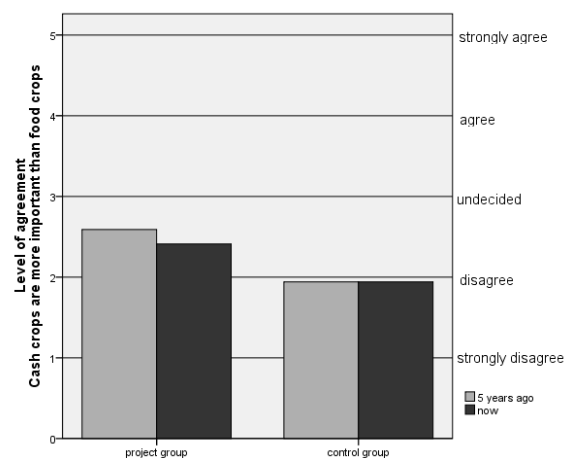


Figure 16: Attitude: Importance of cash crops vs. food crops
(Level of agreement on a scale from strongly disagree to strongly agree)

Effects on food security behaviour

Considering the project group, there is a significant correlation that if the agreement that cash crops are more important than food crops decreased, the share of bought food also decreased ($r_s=0.361^{**}$, $p=0.012$), as well as the current land used for cash crops ($r_s=0.297^*$, $p=0.033$), and vice versa. Also, within the control group there is a correlation between attitude and land used for cash crops ($r_s=0.417^*$, $p=0.048$).

Effects on food security situation

Regarding the importance of cash crops vs. food crops there are different correlations. The more the level of agreement within the project group that cash crops are more important than food crops decreased during the last 5 years, the higher the current food security situation ($r_s = -0.279^*$, $p = 0.043$). Within the control group, despite there is no change of attitude on average, there is a correlation that the lower the level of agreement that cash crops are more important than food crops, the more the situation increased during the last 5 years ($r_s = -0.414^*$, $p = 0.049$). Both correlations show that the attitude regarding food and cash crops has an important influence on the overall food security situation.

Knowledge about improved farming methods*Effects on food security behaviour*

Looking at the current level of knowledge about improved farming methods (see Figure 14) we can realise that, within the project group, a higher level of knowledge goes hand in hand with a lower share of bought food ($r_s = -0.275^*$, $p = 0.045$). Within the control group there is no noticeable correlation in this regard. Nevertheless, the higher the current level of knowledge within the control group, the lower the share of land used to cultivate cash crops ($r_s = -0.497^*$, $p = 0.021$).

Effects on food security situation

As elucidated in chapter '5.2.1 Availability' there is a significant correlation between knowledge and food security situation. There is no such correlation within the control group.

5.2.4. Summary & Discussion – Access

- **Increased land use for cash crops of F2M farmers raises income**

Within the project group there is a connection between increased share of land used for cash crops and rising income. There is no such connection within the control group. The improvement within the project group was possible because main parts of this land were not in use before. It was not on the expense of land used for food crops. Within the control group the share of land used for cash crops increased to a high extent. Nevertheless, income increased to a smaller extent. The project group could use the land more efficiently and gain more income through growing marketable crops. These changes were mainly triggered by the F2M project.

- **Food expenses decreased – Increased income left for further development**

The income of farmers increased to a higher extent within the project group. Nevertheless, the share of income used to buy food decreased, due to increased self-sufficiency made possible through higher yields. Increased household income enables farmers to meet basic needs such as paying school fees and health expenses (UNEP-UNCTAD, 2008). Results showed that income is used mainly for education, health expenses, home utilities and to reinvest in agriculture. Additional income therefore creates a potential for further development. It improves the ability of farmers to also improve non-food factors of food security, such as health care. According to Pinstrup-Andersen (2009), food security depends to a high degree on non-food factors, such as access to primary health care.

The F2M project contributed to a high degree to the change through encouraging farmers to increase the share of self-sufficiency and raising income at the same time. According to Bahiigwa (1999), although 95 % of households depend on own production as the main source of food, the main coping strategy for food insecure households is to buy food at the market. Therefore there is, especially during times of food shortage, a high need for income. Through increased income farmers can improve their ability to cope with times of famine.

- **Attitude regarding cash and food crops results in behaviour**

The level of agreement that cash crops are more important than food crops influences both the behaviour and the overall food security situation to a high degree. If farmers do not agree that cash crops are more important, they focus more on growing food crops on their land. This results in a higher degree of self-sufficiency and in a better food security situation. The F2M project contributed through awareness raising trainings about the importance of having enough food for home consumption. Cash crops are important, but not more important than food crops for the farmers.

- **Knowledge about farming methods influences behaviour regarding access**

If F2M farmers have a higher level of knowledge about improved farming methods, they have to buy a lower share of food on the markets. Thus, farmers depend to a lower degree on volatile markets affected by price fluctuations. Through applying knowledge about improved farming methods, there is more food available, due to increased yields. The F2M project contributed to a high degree to the improvement by giving farmers access to improved seeds and knowledge about improved farming methods.

- **Decision-making pattern: Access to own income for female farmers through F2M**

Often it is argued that increased income through market-oriented production is likely to be controlled by men (Taylor, 2006; Sanginga et al., 2004). The results showed that women decide more often on what to spend income alone or together with their husband in the F2M group than in the control group. The share of households where the man decides alone is lower within the project group. Gender trainings within the project group are decisive for this difference. Additionally, through the F2M project female farmers have better access to income and can decide alone for what to use it.

5.2.5. Utilisation

Composition of food

The group discussions revealed that there is an improvement of the varieties within the project group. Even if there is no improvement in the overall food security situation, in the group discussions farmers indicated that they now have improved seeds and grow crops which are important for the health situation, they eat a balanced diet and have greens in the gardens. The groups prepare well-balanced meals with a different food composition than before, including vegetables.

Also, the awareness about utilisation increased, according to group discussions. The group members care more about a balanced diet and consumption of vegetables is seen as advantageous. Within the control group farmers indicated that they try to eat a variety of food, but this is not always possible. For the frequency of consuming meat, fish, milk and eggs of both sample units see Figure 37 and Figure 38 in Appendix A.

During the last 5 years the frequency of eating vegetables also increased, as Figure 17 shows. 5 years ago 25 % (10 statements) of the project group (n=40, 100 %) never ate vegetables, 10 % (4 statements) every day. Nowadays 92.5 % (37 statements) of the farmers of the project group eat vegetables every day. Within the control group (n=20, 100 %) this share amounts to 80 % (16 statements); 5 years ago to 55 % (11 statements).

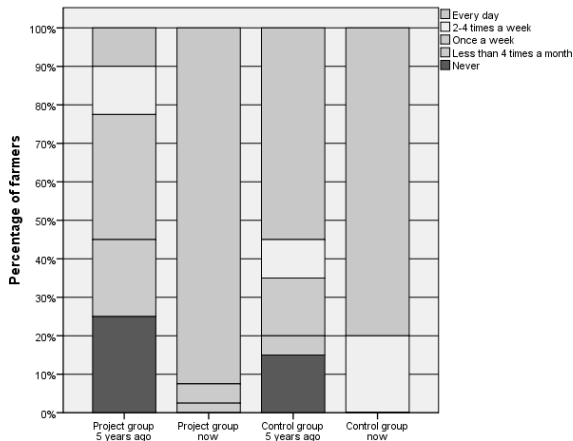


Figure 17: Frequency of eating vegetables

Reasons for the bigger variety are, as some farmers indicated, that they got seeds of new and more resistant varieties mainly from the F2M project (through A2N), NARO, NAADS and HCP.

Moreover, they learnt about the importance of a balanced diet in trainings by the F2M project (carried out by A2N and CIAT), NARO, HCP, NAADS, HODIFA and World Vision. Also, kitchen gardens are decisive.

Every farmer of the project group (n=40) has a kitchen garden, also within the control group (n=20) only one has no kitchen garden and some (3 statements) have greens in the field, because wild animals destroyed their kitchen gardens. According to the farmers, kitchen gardens are very important for a balanced nutrition, dietary diversity, improved health, especially for children, and to prepare a quick meal. Furthermore, the farmers can gain an additional income through selling vegetables. Kitchen gardens were introduced to the project group by the F2M project (CIAT, A2N), NARO, NAADS, HCP, HODIFA and FAL; to the control group by NAADS, HCP, the hospital, and some farmers learnt about them on the radio.

Effects on food security situation

There is a positive correlation of the current frequency of consuming meat ($\tau=0.301^{**}$, $p=0.004$), fish ($\tau=0.224^*$, $p=0.023$), and vegetables ($\tau=0.290^{**}$, $p=0.007$), and the current food security situation observing both sample units.

Attitude and Knowledge

Attitude regarding importance of dietary diversity/vegetables

The attitude regarding the importance of dietary diversity and the importance of eating greens changed in a similar way in both groups (see Figure 39 in Appendix A). Within the project group it changed from 'undecided' 5 years ago up to 'agree-strongly agree', within the control group from between 'undecided-agree' also up to 'agree-strongly agree'.

Effects on food security behaviour

The higher the current level of agreement regarding the importance of vegetables in the meals, the more farmers of the project group eat vegetables now ($\tau=0.308^*$, $p=0.025$). Within the control group there is a connection of the attitude regarding the importance of dietary diversity and the frequency of consuming meat ($\tau=0.473^*$, $p=0.015$), fish ($\tau=0.563^{**}$, $p=0.005$), milk ($\tau=0.500^{**}$, $p=0.008$) and vegetables ($\tau=0.419^*$, $p=0.034$). Within the project group there is no such correlation.

Effects on food security situation

The change of attitude (change of importance of dietary diversity: $r_s=0.526^{**}$, $p=0.000$; change of importance of vegetables: $r_s=0.483^{**}$, $p=0.000$) correlates highly significantly in both groups with the change of the overall food security situation.

Knowledge about food preparation

The level of knowledge regarding the preparation of well-balanced meals increased in both sample units. Within the project group it changed from 'okay' up to 'high-very high', within the control group from 'okay' to 'high', as Figure 18 shows.

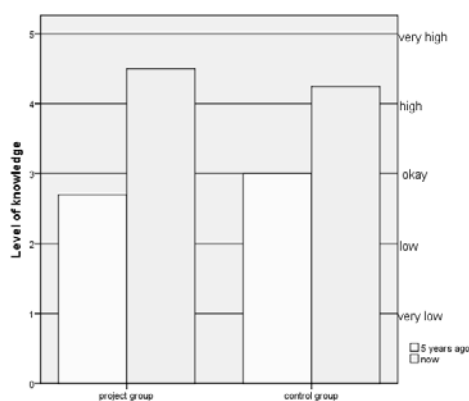


Figure 18: Level of knowledge about preparation of well-balanced diet
(on a scale from very low to very high)

Farmers of the project groups ($n=40$) learnt to eat a balanced diet, to eat a variety of food, not to waste food and to eat greens. The control group ($n=20$) learnt these things as well. 15 % (3 statements) of the farmers of the control group stated that they did not learn anything new in this regard.

Farmers of the project group received trainings by the F2M project (carried out by A2N and CIAT), NARO, HCP, NAADS, HODIFA and World Vision. Some farmers of the control group received trainings by NAADS, HCP and World Vision. 45 % (9 statements) of the farmers of the control group stated that they did not get any training. Some farmers learnt these things in the hospital (10 %, 2 statements) or heard it on the radio (15 %, 3 statements).

Effects on food security behaviour

The level of knowledge about preparing meals with a dietary diversity now highly correlates with the frequency of eating meat ($\tau=0.278^*$, $p=0.035$), fish ($\tau=0.352^{**}$, $p=0.010$), eggs

($\tau=0.244^*$, $p=0.044$), and vegetables ($\tau=0.276^*$, $p=0.039$) within the project group. Within the control group the level of knowledge correlates with the consumption of vegetables ($\tau=0.388^*$, $p=0.036$).

Effects on food security situation

The change of knowledge influences the change of the food security situation in both sample units (project group: $r_s=0.428^*$, $p=0.003$; control group: $r_s=0.460^*$, $p=0.021$).

Interdependencies between attitude and knowledge

Changes of the level of knowledge about preparing meals with a dietary diversity correlates highly significantly with the changes of importance of dietary diversity ($r_s=0.618^{**}$, $p=0.000$) and adding vegetables to the meals ($r_s=0.609^{**}$, $p=0.000$) in both groups.

Distribution patterns

A further aspect is the distribution of food within the household. Only in one case of the whole sample unit ($n=60$) there is an equal distribution between man and woman (see Figure 40 in Appendix A). In all other cases there is an unequal distribution. In most cases the children get the meal first (see Figure 41 in Appendix A). But in 35 % of households of the project group and in 25 % of the control group, the man gets the meal first. In 93 % of the cases in the project group and 89 % of cases in the control group the woman eats last.

Statements of farmers in the group discussions verified this observation. Female farmers of one group indicated that women are most affected from food insecurity. They ensure to have enough for the family, and only if all other family members have enough the women care for their own food security.

Attitude and knowledge

Attitude regarding importance of equal distribution

There is a change of the attitude regarding equal distribution within the family in both sample units, according to individual interviews (see Figure 42 in Appendix A). The agreement increased, questioned if an equal distribution within the household is important. Within the project group the importance increased from 'undecided' 5 years ago to 'agree-strongly agree' on average now. Within the control group it improved from nearly 'agree' 5 years ago to also 'agree-strongly agree'.

Effects on food security behaviour

Although the importance of equal distribution increased, there is still no equal distribution between man and woman.

Effects on food security situation

Considering the change of the importance of an equal distribution during the last few years, there is a correlation with the change of the overall food security situation within the project ($r_s=0.376^{**}$, $p=0.008$) and the control group ($r_s=0.436^*$, $p=0.027$).

Knowledge about gender issues

Farmers of the project group got training on gender issues by the F2M project. Trainings in this direction were not stated by farmers of the control group.

5.2.6. Summary & Discussion –Utilisation

- **Raising awareness: Composition of food essential for improved health – Influences on behaviour and food security situation**

Food availability and access alone are insufficient to assure food security. Several complementary factors related to the utilisation of food must also be in place (Benson, 2004). Dietary diversity is an important indicator for food security (Hoddinott & Yohannes). Different varieties and a balanced diet are decisive to improve household food security and especially the health condition of children living in the household. F2M farmers are aware of this linkage, as well as farmers of the control group. Different organisations are working with farmers in the area to strengthen the awareness about the importance of food composition for the health of the family. Therefore, there are only slight differences between the two sample units regarding the attitude in this direction. Attitude influences behaviour regarding food composition and the food security situation to a high degree.

- **Improved knowledge about food composition – Easier to translate for F2M farmers**

If knowledge about food preparation and feeding practices is not available, forms of hidden hunger occur despite sufficient availability of food (Walaga & Hauser, 2005). This underlines the importance of the dimension of utilisation. Both sample units improved their knowledge about the preparation of well-balanced meals, F2M farmers to a slightly higher degree. Farmers of both groups changed their food composition, to a higher extent within the project group. F2M farmers have better capabilities to improve their food composition, through better access to improved

seeds and knowledge. In this way the F2M project contributed to an improved food composition. Knowledge influences not only behaviour - farmers eat more meat, fish, eggs and vegetables if they have a higher level of knowledge - but also the attitude of farmers. If farmers know more about well-balanced meal preparation, dietary diversity and vegetables are also more important to them. This underlines the importance of knowledge for a balanced food composition.

- **Kitchen gardens – Decisive contribution to dietary diversity and food security**

Kitchen gardens and growing vegetables is essential for a majority of farmers. Children are healthier and women are able to prepare quick, well-balanced meals. Knowledge about it is essential and results in changed behaviour in both groups. Due to better framework conditions F2M farmers eat vegetables more frequently and have an improved food composition.

- **Low empowerment regarding food allocation within household**

Food security is not simply a question of producing enough food (UNEP-UNCTAD, 2008). Even enough food does not assure food security for all household members if the intra-household allocation is not based on the needs of each member (Pinstrup-Andersen, 2009). Therefore intra-household distribution is an important aspect of food security. Although the attitude changed regarding the importance of equal distribution, the changed attitude does not result in a food allocation based on the needs. Women in most cases eat last; men often first. In fact, the statements of farmers show that female farmers are still no equal partners within the household. This way of thinking is still widespread. Reasons can be cultural traditions and circumstances standing in the way of an equal distribution. On group level female farmers are nevertheless active and self-confident. This development is to a high degree due to group activities and duties taken over on behalf of the group, supported by the F2M project.

5.2.7. Stability

This chapter discusses the changes of behaviour regarding storage, such as usage of storage facilities, percentage and duration of storage.

Storage facilities

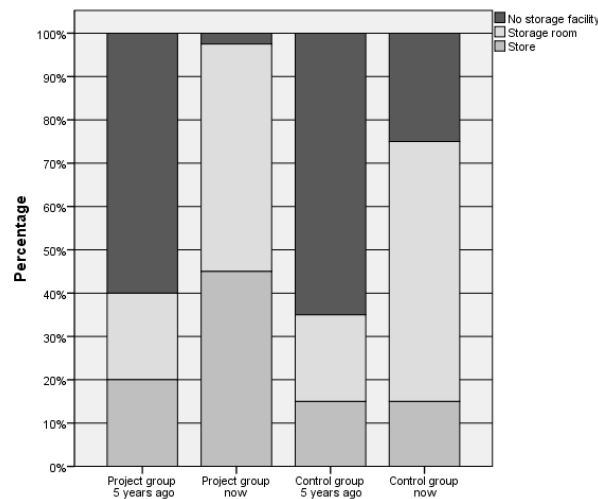


Figure 19: Storage facilities

As Figure 19 shows, 97.5 % (39 statements) of the project group (n=40, 100 %) have a store or a separate room to store their production. Only one farmer of the project group indicated that she has currently no store or storage facility. Five years ago 60 % (24 statements) had no storage facility. Within the control group there are 75 % with a store or separate storage room today; 25 % (5 statements) have no extra storage facility. Five years ago 65 % (13 statements) had no storage facility within the control group.

Quantity of storage

Share of total yield - Share of storage for food shortage

Figure 20 shows the share of average storage of the total yield of farmers. Today, within the project group (n=40) on average more than half (53.75 %) of the harvest is stored. Five years ago the share amounted to 32.75 %. The control group (n=20) stores on average 45.5 % of the harvest today; 5 years ago farmers of the control group stored 32 % of their total harvest.

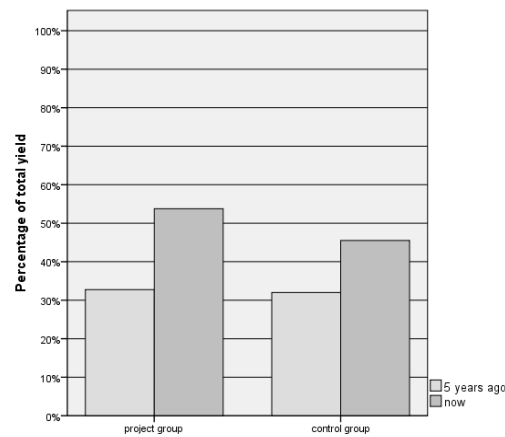


Figure 20: Average storage of total yield

There are slight differences between the **high and low performers** of the project group. High performers (n=28) increase the share by about 21.79 %; low performers (n=12) by about 19.17 %. In the control group the share of storage increased by about 18.5 % within the high performers (n=13), within the low performers (n=7) by about 4.3 %.

The situation is similar looking at the share of storage exclusively for times of food shortage (see Figure 44 in Appendix A). Nearly half (49.5 %) of the storage within the project group is used only in times of food shortage. Five years ago 29 % were stored for this purpose. Within the control group 41 % of the storage is used in times of food shortage, 5 years ago 27.5 %.

There are significant differences between the **high** (n= 41) and **low performers** (n=19) of each group. Within the high performers of the project group (n=28) the share of storage only for times of food shortage increased on average by about 26 %, within the low performers (n=12) by about 7.5 %. Within the control group the share of storage of high performers increased by about 17.7 % (n=13); of low performers (n=7) by about 5.7 %.

Duration of storage

The average duration of storage (see Figure 21) within the project group (n=40) is 6.4 months (approx. 26 weeks), 5 years ago it was 4.8 months (approx. 19 weeks). Within the control group (n=20) storage lasts 3.4 months (approx. 14 weeks), 5 years ago 2 months (approx. 8 weeks).

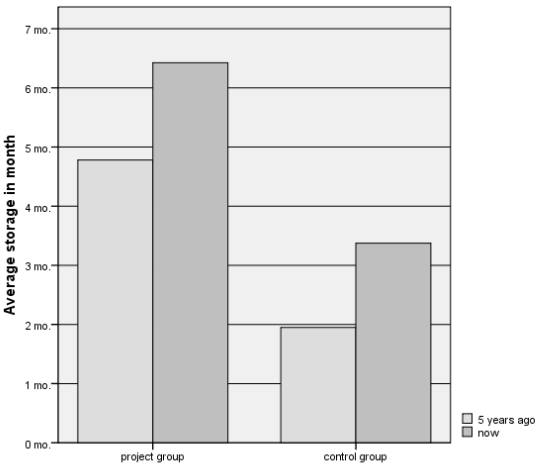


Figure 21: Average duration of storage

There are significant differences between the **high and low performers** of the two sample units. The high performers of the project group (n=28) improved the duration of the storage by about 2.4 month, the low performers decreased the duration by about 0.1 month (approx. 3 days) on average. Within the control group the high performers (n=13) increased the duration by about 1.8 month, the low performers (n=7) by about 0.7 month (approx. 21 days) on average.

Effects on food security situation

There is a correlation between the increase of the overall food security situation within the project group during the last 5 years and the increased share of storage for food shortage ($r_s=0.432^{**}$, 0.003) and the duration of storage ($r_s=0.379^{**}$, $p= 0.008$). Within the control group there is a correlation that the longer the storage lasts, the better the food security situation ($r_s=0.515^{**}$, $p=0.010$).

Attitude and Knowledge

Attitude regarding storage

Figure 22 shows that the attitude regarding storage changed. Asked about if the farmers think it is important to store food for times of food shortage, the level of agreement improved on average in both sample units. The level of agreement changed within the project group from ‘disagree-undecided’ up to ‘agree-strongly agree’, within the control group from ‘undecided’ to ‘strongly agree’.

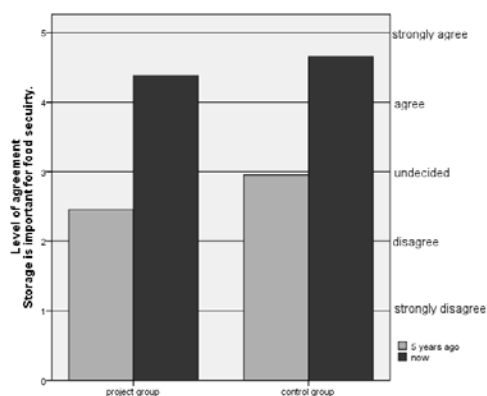


Figure 22: Attitude: Importance of storage for food security
(Level of agreement on a scale from strongly disagree to strongly agree)

As reasons for the changed attitude regarding storage, the farmers of the project group (n=40) indicated trainings by the F2M project (A2N, CIAT), NARO, NAADS, HCP and HODIFA. Farmers of the control group (n=20) stated that their attitude changed because of trainings by NAADS, HCP, and UNDP, and an increased family size.

Effects on food security behaviour

If the importance of storage improved within the project group during the last 5 years, the share of total storage ($r_s=0.304^*$, $p=0.028$) and the share of storage for food shortage increased ($r_s=0.338^*$, $p=0.016$) as well. Within the control group there is a correlation that the higher the actual importance of storage, the higher the share of storage for food shortage ($r_s=0.547^*$, $p=0.006$).

Effects on food security situation

Within the project group there is the correlation between the importance of storage and the food security situation ($r_s=0.492^{**}$, $p=0.001$). Observing the changes there is also a correlation within the project group. There is no direct correlation with the food security situation within the control group.

Knowledge about storage

The level of knowledge changed, as Figure 23 shows, within the project group from a level between 'low and okay' up to a 'high' level of knowledge. Within the control group there is a slight improvement.

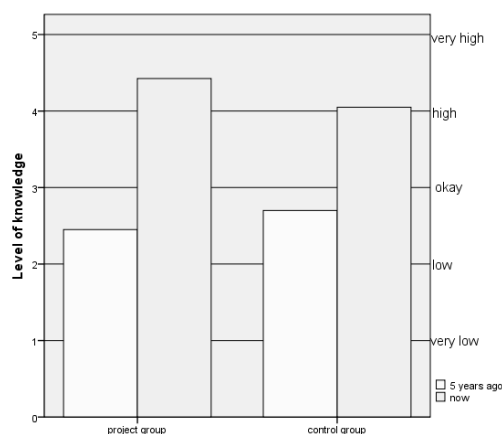


Figure 23: Level of knowledge about storage
(on a scale from very low to very high)

The farmers of the project group stated that they received trainings by the F2M project (CIAT, A2N), NARO, NAADS, HODIFA and HCP regarding storage. Farmers of the project group (n=40) indicated that they learnt in trainings to establish a store or to store for times of famine (16 statements), about proper storage (14 statements), how to dry products (8 statements), to use (organic) pesticides in storage (3 statements) and which crops to store (2 statements).

In contrast, 12 farmers (60 %) of the control group (n=20, 100 %) indicated that they did not gain any new knowledge. The rest indicated that they got trainings by NAADS, UNDP and HCP and learnt to be with store and storage for times of famine (4 statements), about proper storage (3 statements) and how to use pesticides in storage (1 statement).

Effects on food security behaviour

If the level of knowledge regarding storage improved during the last 5 years within the project group, the share of total storage ($r_s=0.406^{**}$, $p=0.005$) and the share of total storage for food shortage increased as well ($r_s=0.493^{**}$, $p=0.001$), and the duration of storage expanded ($r_s=0.582^{**}$, $p=0.000$). Within the control group there is no such correlation.

Effects on food security situation

In both sample units there is a highly significant correlation between the level of knowledge about storage and the current food security situation ($r_s=0.483^{**}$, $p=0.000$).

Interdependencies between attitude and knowledge

The more the level of knowledge about storage improved within the project group during the last 5 years, the more the importance regarding storage improved ($r_s=0.431^{**}$, $p=0.003$). Within the control group there are no such correlations.

5.2.8. Summary & Discussion – Stability

- **Storage decisive for overall food security – Increase of storage of F2M farmers**

Storage of agricultural production is decisive for stable food consumption throughout the year and to overcome seasonal shortages (Callens & Seiffert, 2003). The results show that significantly more F2M farmers are using storage facilities, are storing a higher share in total and for food security purposes. Additionally, storage lasts longer now. This is influencing the food security situation to a high extent. The F2M contributed to a high degree to the changed behaviour through trainings.

- **Raising awareness of importance of storage – F2M farmers and control group**

In both sample units one can realise an improved awareness to the importance of storage. The changed attitude resulted to a high extent to a changed behaviour within the project group. The changed attitude within the project group was mainly triggered by awareness raising trainings by the F2M project and partly other organisations.

- **Behaviour change of F2M farmers regarding storage through improved knowledge**

Level of knowledge influences behaviour to a high degree within the group of F2M farmers. Within the control group knowledge does not translate into behaviour changes to the same extent. This results from knowledge gaps about storage.

5.3. The wider picture

Q3: Which other circumstances are influencing food security?

5.3.1. Demography of food security

Age

Effect on food security situation

Figure 24 shows that, on average, farmers of the control group are younger than farmers of the project group. In both groups the high performers are on average younger than the low performers. Within the project group there is a significant negative correlation between the age of the farmers and the change of situation ($r_s = -0.309^*$ $p = 0.026$). Within the control group there is no such correlation.

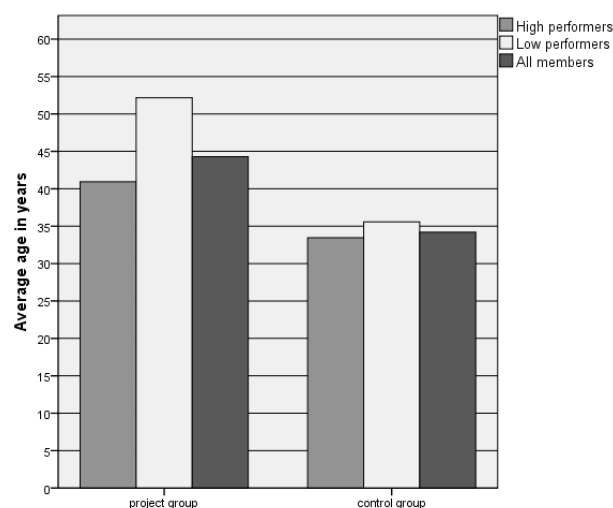


Figure 24: Average age–Difference between high and low performers of project and control group

Effect on attitude and knowledge

There is no influence of the age on attitude and knowledge within the project group. Within the control group the attitude and knowledge changed to a lower degree with increasing age.

Family Size

Effect on food security situation

Figure 25 shows that there is a bigger family size on average in the project group and that there are only slight differences between the average family sizes of low and high performers. Also, the average of children living in the households of the farmers is illustrated. On average, there are more children living in a household of the project group. There is a difference between high and low performers within the groups. Within the project group there are more children in households of low performers, within the control group it is the opposite.

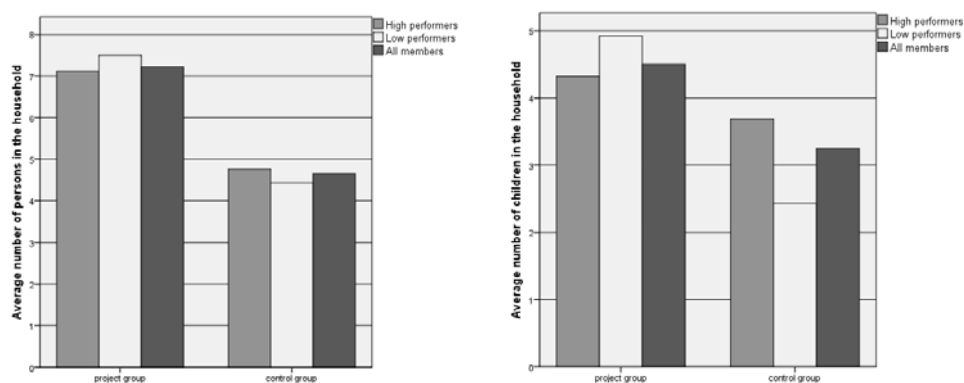


Figure 25: Family size – Difference between high and low performers of project and control group

Effect on attitude and knowledge

Within the project group the data gained shows a clear correlation between the family size and the change of the attitude regarding the importance of food security ($r_s=0.410^{**}$, $p=0.004$). There is no such correlation within the control group. Knowledge about improved farming methods is significantly lower with increasing family size within the project group ($r_s=-0.293^*$, $p=0.033$) and the control group ($r_s=-0.521^{**}$, $p=0.009$).

Education

Effect on food security situation

Figure 26 shows the differences between the education levels of high and low performers within each group. There is a higher share of better educated farmers within the high performers of the project group and partly within the control group.

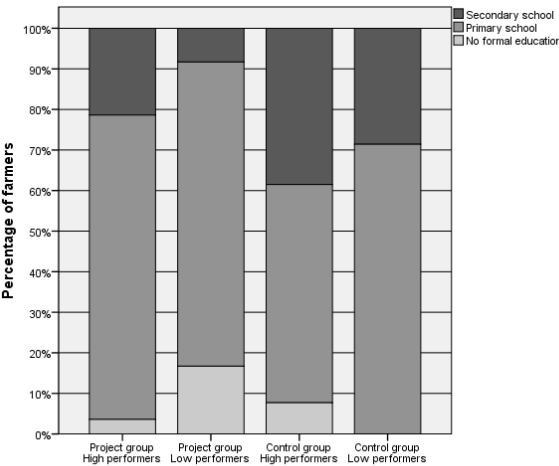


Figure 26: Education- Difference between high and low performers of project and control group

Effect on attitude and knowledge

Data gained shows the linkage within the project group between the education level and the attitude, namely the importance of dietary diversity ($\tau=0.272^*$, $p=0.041$) and the change of importance of storage ($\tau=0.261^*$, $p=0.037$).

Within the control group the education level is associated with the attitude questioned, namely the importance of food security ($\tau=0.476^*$, $p=0.015$), of cash crops ($\tau=0.401^*$, $p=0.031$) and storage ($\tau=0.372^*$, $p=0.049$), distribution ($\tau =0.387^*$, $p=0.042$) and dietary diversity ($\tau =0.434^*$, $p=0.027$).

Position in the group

Effect on food security situation

Figure 27 shows the different distribution of positions, taking over special tasks on behalf of the group, within the high and low performers of each group. It shows that there is a higher share of farmers who have a position in the group within the high performers of the project group.

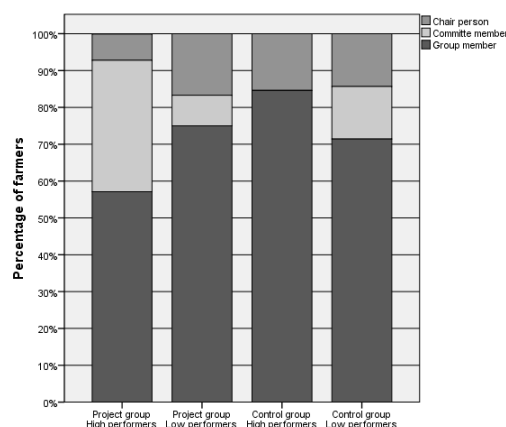


Figure 27: Position in the group – Difference between high and low performers of project and control group

Effect on attitude and knowledge

There is no significant correlation of the position within the group and gained knowledge in both groups. The data show that there is a correlation within the project group of the position and the attitude regarding the importance of dietary diversity ($\tau=0.273^*$, $p=0.039$).

Effect of Education on Position in the Group

Within the project group there is a linkage between the position in the group and the education level of farmers ($\tau=0.314^*$, $p=0.019$). Within the control group there is no such correlation.

5.3.2. Summary & Discussion – Demography

- **Increased age – Barrier to improve food security situation**

Results show that older F2M farmers could not improve their situations to the same extent as younger farmers. They are potentially more affected by sickness and weakness. Attitude and knowledge are not influenced by the age of the farmers within the project group due to appropriate trainings. Within the control group the age influences attitude and knowledge to a higher degree. With increasing age, attitude and knowledge changed to a lower degree within the control group. This is due to a lack of influences and sources of knowledge from outside.

- **Family Size – Increasing importance of food security issues**

On average, there are more children in households of the project group and there are more children in households of low performers. This shows that it makes it harder to ensure food security if there are more children to care for. Also, a study carried out in Ethiopia investigating

the impacts of food security programmes revealed that the gain from these programs is significantly higher for households with small family size (Abebaw et al., 2010).

Food insecurity is often associated with worries, as group discussions and the individual interviews revealed. Within the project group the correlation between an increased family size and the change of attitude regarding the importance of food security underlines that. The lower change of knowledge about improved farming methods, if there are more family members may result from less time to participate in training and group activities.

- **Reducing disadvantages of lower educated farmers through trainings**

The results show that education is influencing attitude to a high degree. This is clearly visible within the control group and indicates that if farmers of the control group have a higher education they are more aware of the importance of food security issues. This connection is not as significant within the project group. Reason can be that through trainings F2M farmers learnt, also if they have a lower institutional education, about the importance of food security. Without additional trainings educational level is indeed crucial for the awareness of the importance of food security issues, as data of the control group showed. Nevertheless, there is no direct correlation of the level of education to the food security situation. Also, previous studies did not reveal any specific pattern and determined no (Abebaw et al., 2010) or only a marginal contribution (Bahiigwa, 1999) to the household food security situation.

- **Position within the group – Only slight effects**

There was no direct effect on the overall food security situation and on knowledge through a special position within the group. Only slight influences on the attitude were visible. Nevertheless, the share of farmers with a position in the group is higher within high performers of the project group. This may result from a better integration within the group and a more active involvement in group activities.

5.3.3. Constraints to food security

There are constraints hindering the performance of farmers and, subsequently, to improve the food security situation. Therefore, it was asked which challenges farmers are facing in individual interviews and in group discussions.

Medical conditions

According to the statements of the farmers, sickness is a widespread challenge. 70 % of each sample unit (28 statements within the project group, 14 statements within the control group) indicated that diseases within the family are crucial constraints to be more food secure due to less ability to work and high medical expenses. 7.5 % (3 statements) of the project group and 20 % of the control group (4 statements) indicated sickness of group members as challenging within the groups. Group discussions also verified this. 7.5 % (3 statements) of farmers of the project group and 5 % (1 statement) of the control group indicated increasing age to be constraining, due to weakness and sickness.

Weather Conditions

Within the project group (n=40, 100%) 52.5 % (21 statements) of the farmers indicated that climate change is a challenge that makes it harder to be food secure. Within the control group (n=20, 100%) this share amounts to 55 % (11 statements). For farmers, the term climate change is a synonym for changes in connection with weather conditions. It is used to describe weather fluctuations, the shifting of (planting and harvesting) seasons, heavy rainfall, drought, storms etc. Group discussions verified these results. Farmers indicated that weather conditions are influencing their food security situation strongly. Through the changes of the season, weather is difficult to predict and crops are affected by heavy rainfall and drought. This can cause harvest shortfalls. Furthermore, planning capacities of farmers for collective marketing are affected. Weather changes are a main factor for a decreasing situation of low performers.

Pests and diseases

22.5 % (9 statements) of the project group indicated that pests and diseases are decisive challenges; within the control group 30 % (6 statements) indicated this. It is furthermore a main factor for decreasing food security situations of low performers in both groups. Also, group discussions showed that it is a very challenging constraint. Control groups indicated a lack of knowledge about how to control pests and diseases as the main reason for a decreasing overall food security situation.

Availability of land

Also, the availability of sufficient land, both for food and cash crops, is decisive. As Figure 28 shows there are 17.5 % (7 statements) within the project group according to which farmers have not enough land for food crops, within the control group this share amounts to 55 % (11 statements). On the other hand there are 47.5 % (19 statements) who have not enough land for cash crops within the project group, within the control group this share amounts to 80 % (16 statements). Also, group discussions revealed that this is one of the main factors for different food security situations within the groups.

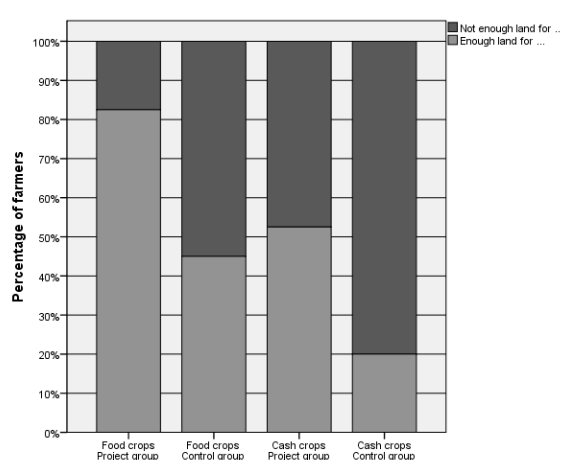


Figure 28: Restriction through land scarcity

There is a significant correlation of the availability of land and the overall food security situation in both sample units. There is a higher correlation within the control group ($r_s=0.484^*$, $p=0.015$) than within the project group ($r_s=0.281^*$, $p=0.039$).

Burden of work for female headed households

22.5 % (9 statements) within the project group indicated that working alone, without a man or husband, is a further constraint to be more food secure. Within the control group 10 % (2 statements) indicated similar problems.

The share of women without man amounts to approx. 35 % in the project group and to 45 % in the control group. They have to care for their children and ensure food security alone. Figure 29 shows that within high performers of the project group there is a higher share of men-headed households; within the low performers there is a higher share of female-headed households. Within the control group it is the opposite.

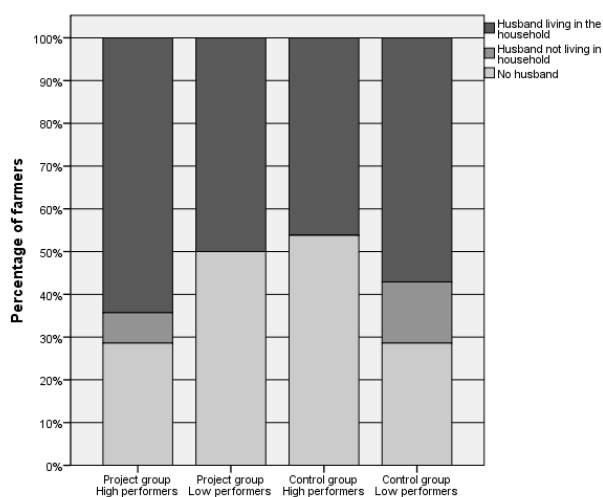


Figure 29: Status of farmers - Difference between high and low performers of project and control group

Low level of mechanisation

5 % (2 statements) of the farmers of the project group indicated that the lack of tools is very challenging. This was also often indicated when asked about the needs of farmers. They would need tractors and further tools to reduce the work-load, often carried out mainly by women (Hine & Pretty, 2006). One farmer of the project group furthermore indicated that making manure is very work- and time-intensive.

Disturbance through (wild) animals

Often wild animals or own livestock is destroying the cultivation on the fields and in the kitchen gardens. 15 % (6 statements) of the project group and 10 % (2 statements) of the control group indicated this as a challenge to be more food secure. Group discussions also revealed this problem.

Group cohesion

A further challenge within the groups is low group cohesion. According to Scialabba (2007), a coherent group organisation results in an improved performance. Low group cohesion can therefore be a constraint to food security. According to 5 % (2 statements) of the farmers of the project group and 20 % (4 statements) of the farmers of the control group, there is no group cohesion within their groups. Furthermore, there are challenges such as some group members not being very active. For example, they are not coming to work together on the fields without indicating any reason. 12.5 % (5 statements) within the project group and 15 % (3 statements) of the control group indicated this. Group discussions showed that there are project groups where not all group members participate in collective marketing. Some members are not

bringing their products, because they are not very active and some sell their products to local traders.

Market conditions

Also, the lack of capital to invest (project group 12.5 %, 5 statements; control group 15 %, 3 statements) and low income (project group 10 %, 4 statements; control group 30 %, 6 statements) were indicated by the farmers, as well as low prices on the markets. Low performers of the control group indicated as reasons for the decreased situation less availability of money to buy food. Group discussions also revealed that there are low prices on the markets, which causes low incomes.

According to the farmers of the project group, even if they are carrying out market surveys, it is hard to find good markets. Some groups indicated that currently there is a lack of appropriate markets. There are low prices and price fluctuations. Transport is a problem, too, when it comes to deliver buyers and to reach potential markets.

Lack of knowledge

Group discussions revealed that within the control group there is a high lack of knowledge, especially on improved farming methods, proper storage, how to control pests and diseases, how to improve soil fertility, how to conserve water and soils, livestock management and how to increase yields. They do not have access to trainings or any other information except the radio or the hospital. Therefore, some failed to cultivate their land properly.

Lack of planting materials and unfertile soils

Group discussions further revealed that within the control group reasons for the differences between the sample units are found in the lack of planting materials and unfertile soils. Low performers of the control indicated losses of soil fertility as reasons for the decrease.

Challenges during the last 5 years

Figure 30 illustrates the challenges farmers faced during the last 5 years. It shows that for more farmers of the control group for example weather changes, sickness, pests and diseases were challenging during the last 5 years, but also the project group was affected.

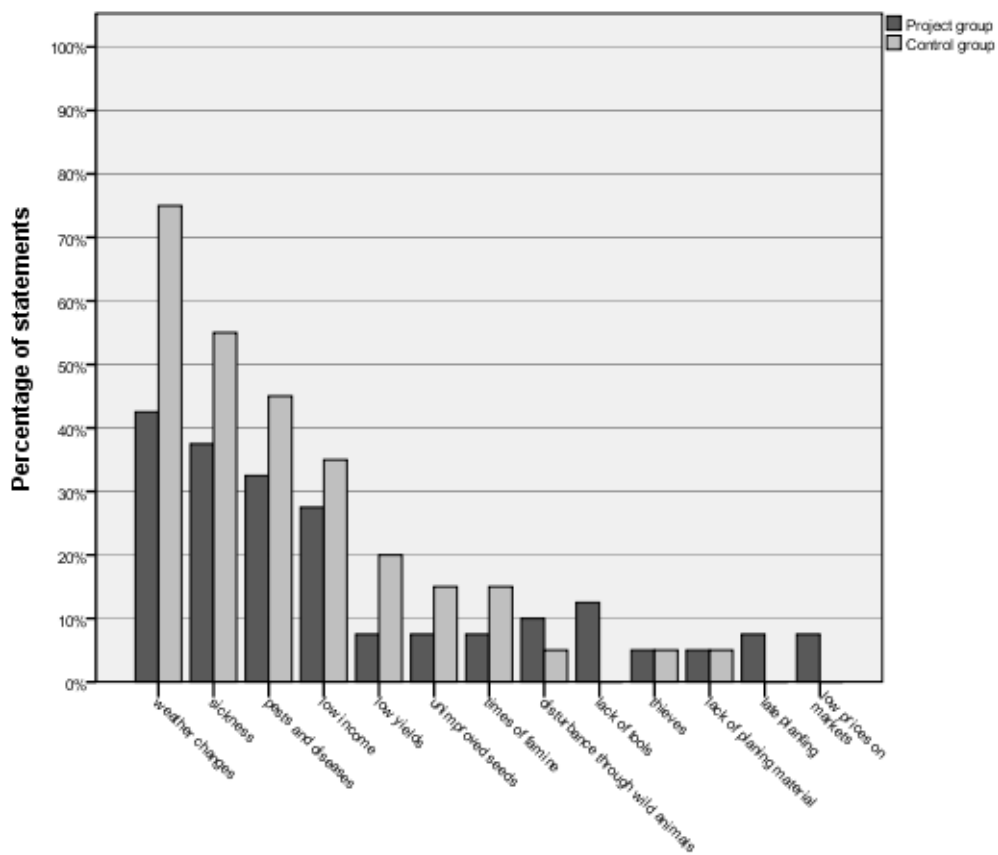


Figure 30: Challenges farmers faced during the last 5 years

Some farmers could overcome the challenges of the last 5 years, as revealed in group discussions, and analysed in individual interviews. Figure 31 shows that within the project group (n=40, 100%) 17.5 % (7 statements) of the farmers could manage to overcome the challenges faced during the last 5 years (see Figure 30), 47.5 % (19 statements) partly. 35 % (14 statements) could not overcome problems, such as sickness and climate change. Within the control group 5 % (1 statement) could overcome the challenges, 20 % (4 statements) partly, and 75 % (15 statements) were not able to overcome the challenges.

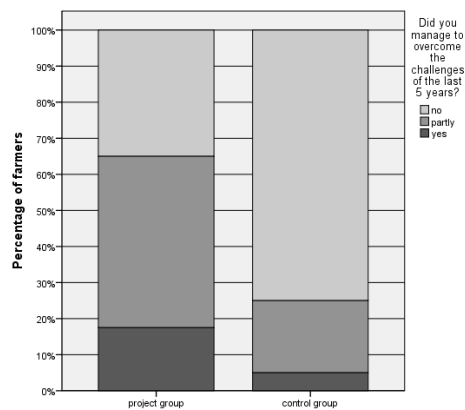


Figure 31: Ability to overcome challenges

Strategies for future challenges

Group discussions revealed that groups participating in the F2M project are thinking about future challenges and are developing strategies to improve their food security situation.

The F2M groups are looking into the future positively. They indicated mainly that they expect that their situation will improve and that they will be food secure in the future. Nevertheless, they indicated changes of the local climate as a serious barrier. One group indicated that if droughts continue to occur steadily there will be no further improvement. They need further improved seeds and more training on organic farming. Another group indicated that through weather changes, triggered through exploration of oil in the area, there will be a decrease of the food security situation. This group plans to plant trees and to build a water tank. They wrote a concrete proposal to gain capital for these investments. Other F2M groups indicated to be planning to increase their income situation through collective marketing, to buy land and to improve soil fertility through organic manure. Furthermore, one group plans to build a common group store. Another indicated to try to improve their situation through farming as a business by group marketing. One group indicated that working together as a group, as well as knowledge, will be their key to success in the future.

Overall, the control group is looking into the future more pessimistically. They think the situation will continue to worsen through weather changes, pests, diseases, sickness, low soil fertility and lack of tools. Only if they get training and improved planting material in the future they see a chance to improve. As strategies the control groups mainly indicated to plan to work hard in future and improve their situation through group activities. Yet, there is no concrete strategy until now.

5.3.4. Summary & Discussion – Constraints to food security

- **Female headed households – Additional challenge**

A number of studies and reports underline the importance of strengthening women's role in agriculture for further development (IAASTD, 2008). Observations showed that female farmers, who cultivate alone, have an additional work-load to feed the family. Food security is hard to reach. These women need, more than others, support from other group members. Nevertheless, there is no clear pattern when analysing differences between high and low performers. Previous studies revealed that female-headed households were more food secure (Bahiigwa, 1999) and benefited more from food security programmes (Abeba et al., 2010). These results cannot be

verified for farmers of the F2M project. Observations showed that due to the additional work load without support of men, it is more difficult for female-headed households to be food secure.

- **Similar constraints – Improved ability to deal with challenges within F2M-groups**

The food security situation is, as the results have shown, highly affected by poor health and sickness, weather fluctuations, pests and diseases, low level of mechanisation and lack of access to land. Previous studies (Bahiigwa, 1999; Hine & Pretty, 2006), too, revealed that weather fluctuations, including unreliable rainfall patterns, pests and diseases are strongly influencing the food security situation of farmers, and showed the connection to landholding (Abebaw et al., 2010). Also, the World Summit on Food Security in 2009 determined, for example, climate changes as particularly harmful to women and smallholder farmers (FAO, 2009).

There are studies underlining the potential of organic agriculture to face future challenges. For example, a study of Bachmann et al. (2007) revealed that organic farmers were in a better position to withstand drought. Some constraints, such as low commodity prices, infertile land, lack of planting materials and use of unimproved seeds, could be overcome through organic transition within the F2M project. There is also a high ability within the project group to deal with challenges, as results showed. F2M-groups are developing strategies to manage the challenges of the future within the group and to improve and stabilise their situation. This ability to get active and to plan for the future is the capital of the F2M farmers to further improve and to be food secure in future.

6. Conclusion and Outlook

The presented results showed that the food security situation of farmers of the F2M project has changed to a high degree. F2M farmers could on average increase their yields, raise their income and improve the quality of their food. Behaviour changes play a decisive role for the changed situation of F2M farmers.

Behaviour changes

In particular, results showed that, on average, F2M farmers increased the degree of self-sufficiency though increased yields. The share of land used for food crops, however, did not change. Investigations revealed that a high degree of self-sufficiency has a positive influence on food security within the scope of the study. F2M farmers increased income and the degree of self-sufficiency at the same time through more efficient land use.

The share of income used to purchase food decreased through increased self-sufficiency. Thus, farmers depend to a lower degree on volatile markets. Additional income is left for purposes such as education, health care, home utilities and to reinvest in agriculture.

Also the food composition changed. For example, farmers eat vegetables, meat, and eggs more frequently and have different crop varieties. Kitchen gardens contribute to a high degree to food security improvements through balanced diets and have a positive impact on health, especially for children.

Additionally, nearly all F2M farmers now have storage facilities and on average they store more in total and for times of food shortages. Also the average duration of storage was prolonged, whereby food availability throughout the year has increased.

The F2M project contributed to these changes to a high degree through awareness and knowledge raising trainings and providing access to improved seeds and different crop varieties. Behaviour changes are influenced and triggered by attitude and knowledge changes, as the results revealed.

Attitude changes

Correlations showed that a more active thinking about food security led to a changed behaviour regarding land use for food crops. Farmers in that case use more land to cultivate food crops.

Also, if farmers did not agree that cash crops are more important, they focused more on growing food crops on their land. This resulted in a higher degree of self-sufficiency and, in the following, in a better food security situation. For F2M farmers cash crops are important, but not more important than food crops, and they try to balance.

Attitudes about the importance of dietary diversity and vegetables influence also behaviour. Food composition, and consequently the food security situation, changed. The F2M project, as well as other organisations strengthened the awareness about the importance of dietary diversity and kitchen gardens.

Attitude changes are therefore decisive for changed behaviour regarding food security. Attitude is an important prerequisite and can be confirmed as a proximal determinant of food security behaviour (Gallant & Maticka-Tyndale, 2004). Nevertheless, results revealed that although the attitude also changed in the control group, this change did not necessarily result in behaviour change to the same extent as in the project group. Knowledge gaps about how to change behaviour to improve food security are considered to be reasons for the missing translation of attitude into behaviour.

Knowledge changes

Through the F2M project knowledge increased to a high extent within the project group. F2M farmers learnt about the importance of food security, improved farming methods, how to deal with markets to increase income, preparing meals with a dietary diversity, and proper storage. Knowledge enables farmers to translate attitude changes into behaviour changes.

Looking at knowledge changes in particular, results revealed that a higher level of knowledge about farming methods goes hand in hand with a higher degree of self-sufficiency through increased yields. On the other hand, farmers have to purchase a lower share of food because of knowledge about improved farming methods.

Also, the level of knowledge about preparing meals with a dietary diversity highly correlates with the consumption of meat, fish, eggs and vegetables. Both sample units improved their knowledge about the preparation of well-balanced meals due to different organisations. Nevertheless, F2M farmers have a higher ability to improve the food composition, through better access to knowledge about improved farming methods and improved seeds.

Moreover, knowledge about storage led to a higher share of storage and subsequently to a better food security situation.

However, knowledge not only directly influences behaviour but also changes the attitude of farmers. If farmers know more, for example about well-balanced meal preparation, dietary diversity and vegetables are more important for them. Knowledge therefore influences behaviour directly and indirectly through attitude changes. This underlines the importance of knowledge for behaviour changes regarding food security.

Differences between high and low performers of F2M group

Differences between high and low performers confirm previous results, for example high performers increased the average degree of self-sufficiency to a higher extent than low performers. They also showed new connections, for example, the share of land used for food crops increased within high performers, whereas the share decreased within low performers. High performers of the F2M group are furthermore on average younger, have fewer children to care for, and are better educated than low performers. Moreover, there are more farmers who have a position within the group, within high performers.

Constraints to food security

Results revealed that F2M farmers could improve their ability to overcome constraints to food security, such as unfertile soils, e.g. by improved farming methods such as the usage of organic manure. F2M farmers are, however, still facing challenges. Above all, sickness, weather changes, pests and diseases are able to hinder food security improvements. Furthermore, land scarcity is an important constraint to food security.

Gender aspect of food security

Gender aspects are decisive for food security. Observations showed that it is harder to be food secure for female-headed-households. Even if a man is living in the household, female farmers often have to ensure food security alone. On household level, women are still no equal partners, especially regarding intra-household food allocation. Although farmers indicated that their attitude changed regarding the importance of equal distribution within the household, this did not result in any behaviour changes towards an equal distribution of food.

Looking at decision-making patterns, slight improvements were noticeable. The share of households where the man decides alone about cultivation decreased. Gained knowledge by the F2M project enables female farmers to decide more qualified about cultivation. In addition, gender trainings within the F2M project were decisive. Through the F2M project female farmers have better access to income and can therefore decide alone for what to use it.

Contribution of the F2M project

Food security is a cross-cutting issue during the F2M project and F2M farmers put strong emphasis on it, although the primary goal is market-orientation. Food security and market-orientation are not necessarily mutually exclusive. Through the F2M project it is possible to combine food security and market-oriented goals. Farmers are able to use land more efficient, supply themselves with enough food, and raised income is left for non-food purposes and further

development. The F2M project, using the ERI approach, ensures that farmers participate actively and experience changes by themselves. F2M farmers translate attitude into behaviour through applying knowledge gained by F2M trainings.

Summarising the studies' findings revealed that the food security situation mainly changed through attitude, knowledge and behaviour changes. The F2M project triggered and supported these changes to a high degree. The improved ability to deal with food security constraints was possible through the F2M project by giving farmers access to knowledge and improved seeds. But also other organisations working with farmers of the project group contributed to the changes by giving farmers improved seeds and trainings, especially about food utilisation.

There are still constraints to food security, also for F2M farmers, such as sickness, weather fluctuations, pests and diseases, and other hindering factors, such as lack of gender equality, large families and low education, which influence household food security and are still challenging.

Recommendations

Results within the scope of this study showed that a higher degree of self-sufficiency has a positive influence on food security. Previous studies also underlined the importance of food from own production for food security purposes (Bahiigwa, 1999). Therefore, it is recommended to emphasise the aspect of self-sufficiency within the Plan for Modernisation of Agriculture (PMA). Improving food security through food self-sufficiency and markets has to be combined, rather than replaced.

Although there are already strong efforts to strengthen gender issues, more emphasis is necessary to empower women, especially on household level. Cultural traditions and circumstances stand in the way of gender equality. Women have to care for their own nutritional needs, to ensure health and further development. Especially female-headed households have to be supported to manage the additional work-load.

Stronger efforts also have to be made to reintegrate group members who are not participating actively in group activities anymore.

To reduce the vulnerability of farmers to losses of harvest due to sickness, weather changes, pests and diseases, an insurance system, possibly within associations, would be advantageous.

The World Summit on Food Security organised by the FAO already declared to be planning to improve access to knowledge to enhance food security processes (FAO, 2009). In previous studies (Bahiigwa, 1999), too, information is seen as an essential element for improving food

security in Uganda. Results within the scope of the study verified that knowledge is the key to food security improvements. Educational deficits and knowledge gaps can be overcome through focused trainings. Farmers have to experience changes by themselves and participate actively in trainings. In this way, the ability of farmers to decide what to do and which knowledge to apply improves.

Reducing dependency on external 'help' and material inputs is essential to empower farmers. Nevertheless, support such as access to improved seeds is helpful to give farmers an appropriate starting point. Previous studies (Bahiigwa, 1999) already suggested to integrate agricultural extension and improved technologies, such as access to improved seeds, into the Plan for Modernisation of Agriculture (PMA). The results of this study revealed similar needs, therefore better access to knowledge and improved seeds are highly recommended. In contrast, financial support alone destroys self-responsibility, improves dependency and does not trigger any behaviour change. Therefore, participative approaches, such as the ERI used in the F2M project, which integrate people actively are highly appropriate to change behaviour sustainably and improve the food security situation.

Methodological reflection

Despite conscientious preparation, conduction and analysis, some points have to be critically reflected. The methodological reflection points out limitations and possible improvements.

- The study is based on the *self-assessment by farmers*. Therefore, it is assumed that information given by farmers reflect attitude, knowledge, behaviour and situation. At this point it has to be noted that farmers do not necessarily indicate real circumstances, because of low self-reflection or no appropriate baseline. Furthermore, different values and preferences among farmers influence the results and make a comparison challenging. This has to be kept in mind considering the study. Due to lack of time and resources, the researcher has to rely on the self-perception of farmers.
- Due to the absence of baseline data about food security in the area, an *ex-post evaluation* had to be carried out to get data from 5 years ago. Collection of information in absolute figures (e.g. of income) was difficult, due to no or incomplete record keeping. Therefore rating scales were used.
- The comparison of a project with a control group is challenging, because data rely on self-assessment of farmers and a different number of informants in each group. The number was chosen to make the study comparable with previous studies in the same

area. Nevertheless, this has to be taken into consideration looking at the comparisons between the two sample units.

- Results of the individual interview rely on responses of only female farmers. This method was chosen because duties in relation with food are still the responsibility of women. Female farmers therefore might have a better insight into the food security situation of the household. However, conducting group discussions with both male and female participants was considered to be a suitable way for analysing food security on group level. Supplementary further research looking at the view on food security issues of male farmers, as important decision-makers within the household, would be interesting for comparisons. Also other household members concerned, such as children and older household members were left out. Looking at the study, it has to be considered that the results are mainly based on data given by female farmers.
- The study does not claim to contain all important factors to food security. Food security behaviour is complex; therefore factors which seemed to be most influential in the local context for the purpose of the study were selected.
- Despite careful preparation and pre-testing, further interesting aspects emerged during the fieldwork, e.g. the question why some group members are more active and involved in group activities than others. Therefore, further research would be helpful to supplement remained questions.

Reflecting the chosen method, conducting individual interviews with a questionnaire and group discussions using different tools was the most suitable approach to find out about attitude, knowledge, behaviour and situation changes, taking into account given conditions regarding time and resources.

7. Abstract

Market orientation and food security improvements of smallholder farmers are sometimes contradicting livelihood strategies. The 'Linking Farmers to Markets' (F2M) project aimed at empowering farmers to get linked to organic markets while at the same time enhancing food security. The study investigates if the project contributed to change the food security behaviour of smallholder farmers to improve their food security situation. Attitudes and knowledge changes were the main domains to explore changes. Group discussions and individual structured interviews were conducted in Hoima, Western Uganda, with five target groups participating in the F2M project and four control groups. Results showed that there are significant differences between the two sample units. Changes in various indicators of availability (yields increased), access (income raised), utilisation (quality of food improved) and stability (food availability throughout the year increased) were observed. Differences in behaviour are mainly found in self-sufficiency, land use for food and cash crops, food composition and storage. F2M farmers on average grow more food by themselves, use less income to purchase food, consume a diverse diet and store more food. This was possible through more efficient land use and strong emphasis on food crops. Through the F2M project it was possible for F2M farmers to raise income and self-sufficiency at the same time. Raised income is left for non-food purposes, like education and health. Female farmers decide more often about cultivation and money spending. Nevertheless, gender equality is still challenging, especially regarding intra-household food allocation. The F2M project contributes to food security behaviour changes through knowledge and awareness raising trainings. F2M farmers could improve their ability to deal with food security constraints. Nevertheless, there are still numerous challenges farmers have to face, like sickness, weather changes, land scarcity, pests and diseases.

Key-words: behaviour change, food security, Enabling Rural Innovation (ERI), organic agriculture, Uganda

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12. Appendix A

Food security situation

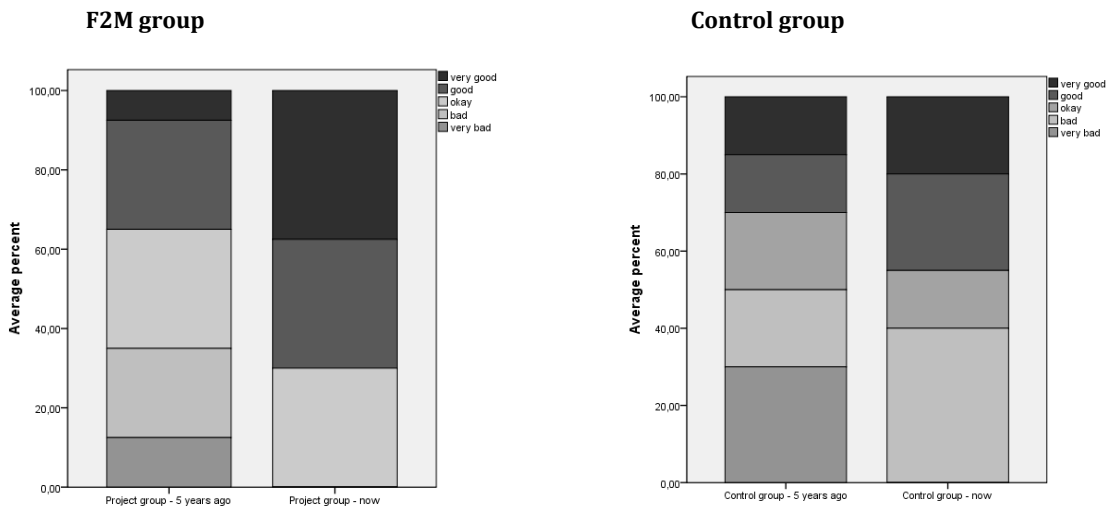


Figure 32: Dispersion of food security situation of project group and of control group

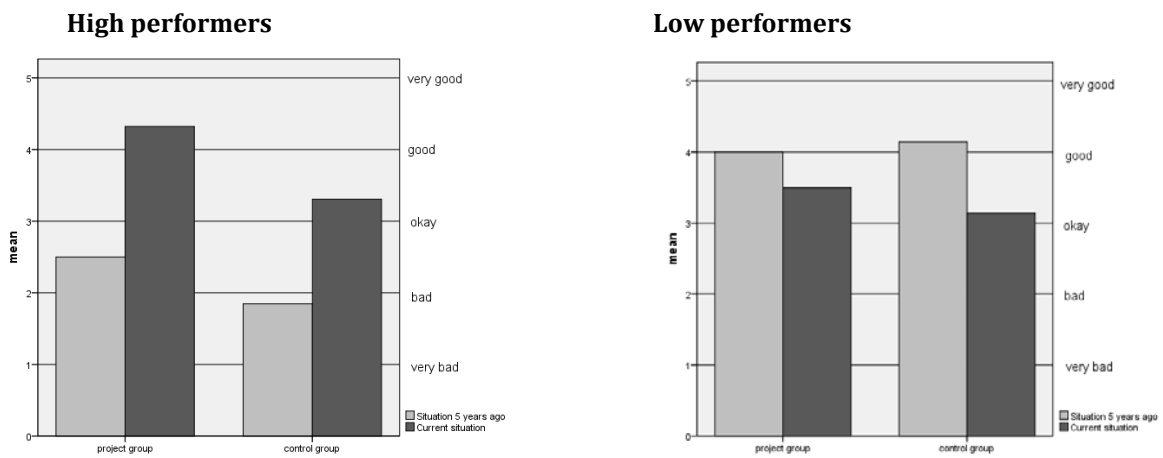


Figure 33: Average change of food security situation of high and low performers
(Self-assessment of farmers on a scale from very bad to very good)

Availability

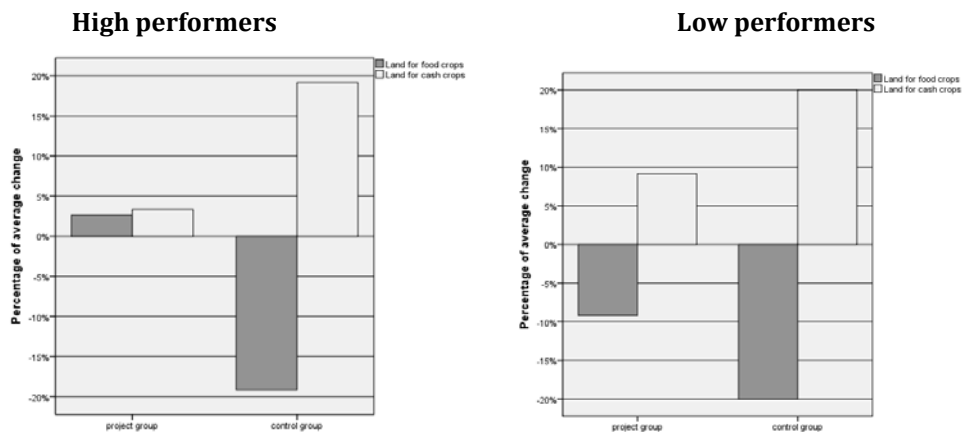


Figure 34: Change of land use of high performers and low performers

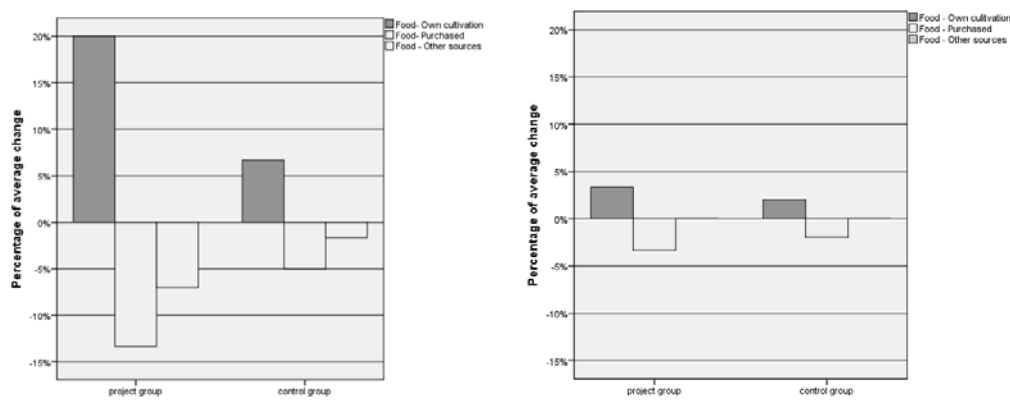


Figure 35: Change of self-sufficiency of high performers and low performers

Access

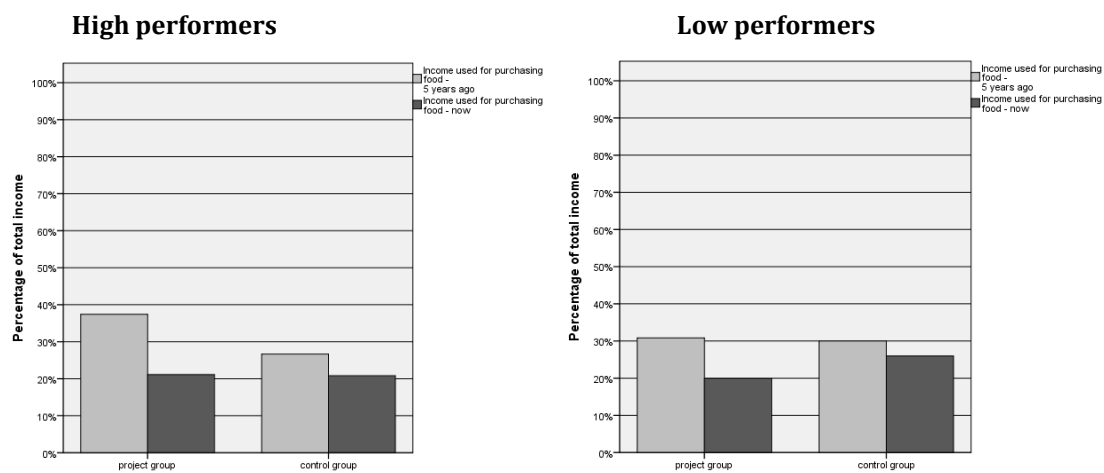


Figure 36: Income use for food of high performers and low performers

Utilisation – Food composition

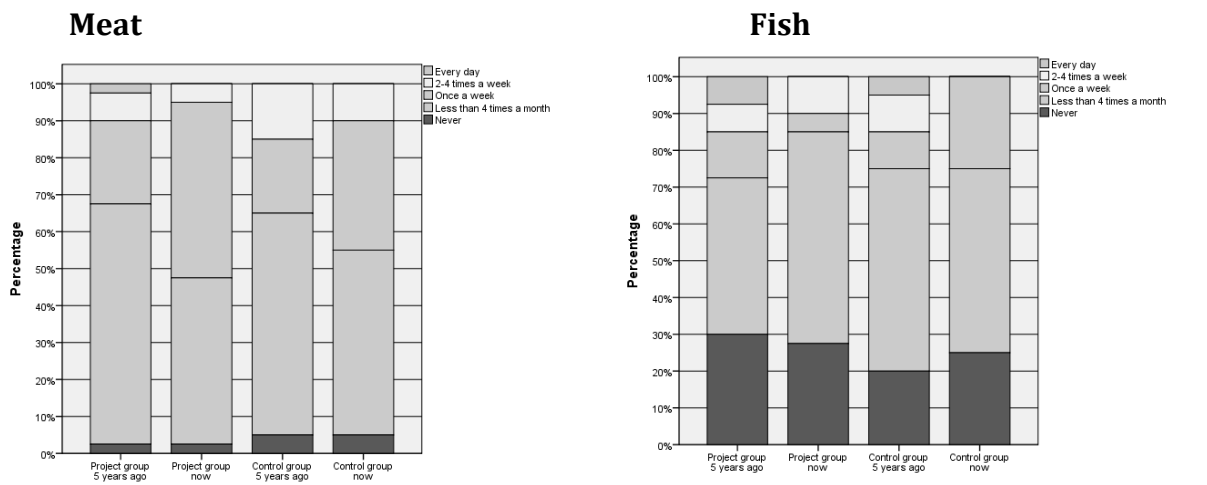


Figure 37: Frequency of consuming meat and fish

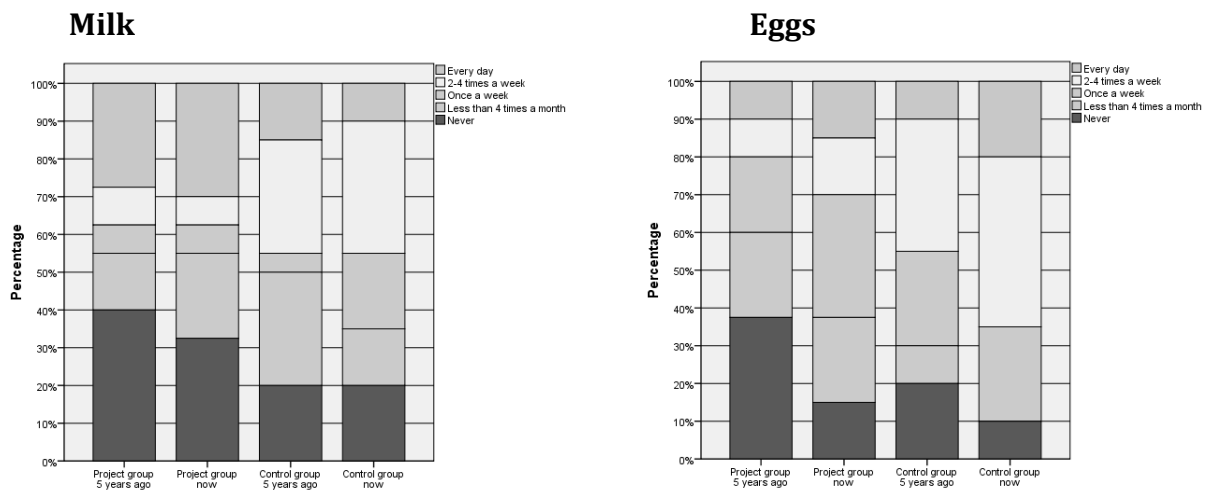


Figure 38: Frequency of consuming milk and eggs

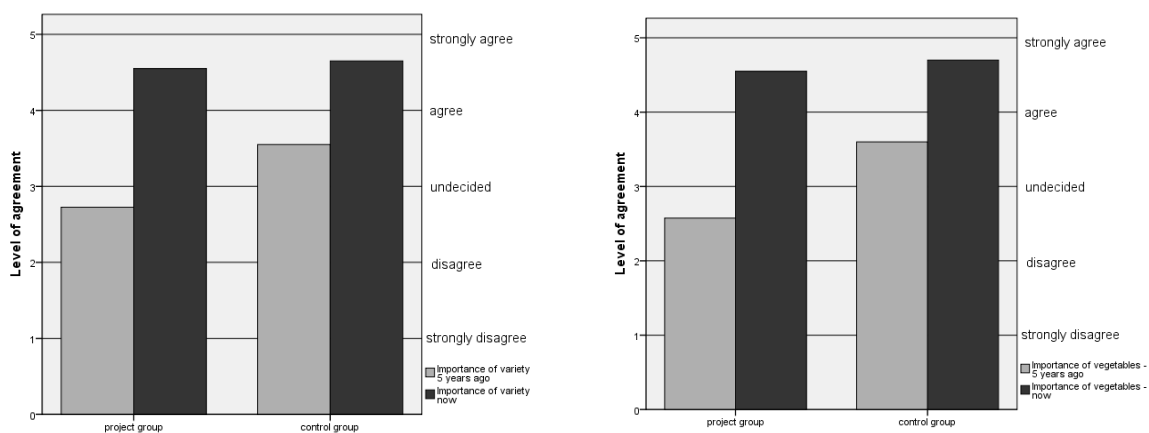


Figure 39: Attitude: Importance of dietary diversity and eating vegetables

Utilisation – Distribution

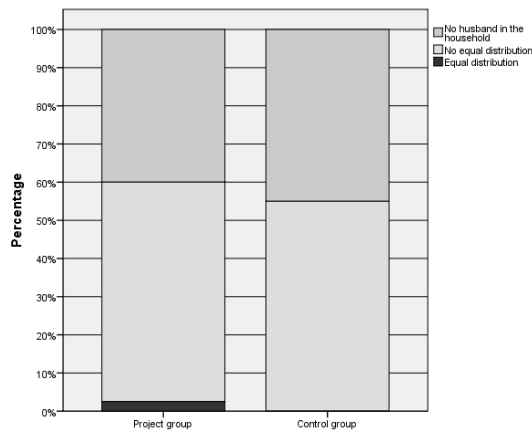


Figure 40: Intra-household distribution

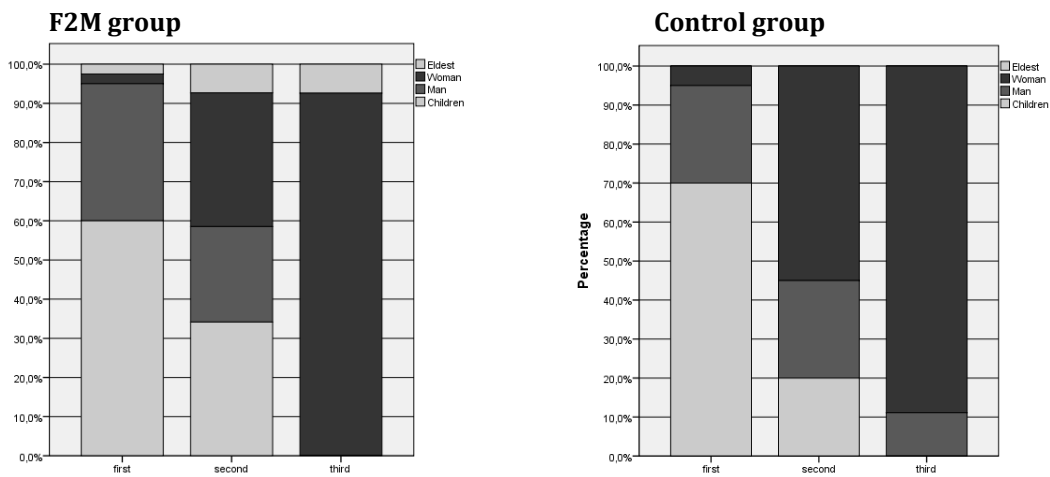


Figure 41: Order of distribution of food within the household – Project group – Control group

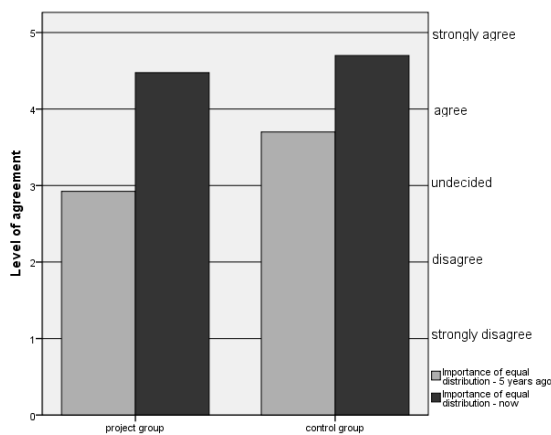


Figure 42: Attitude: Importance of equal distribution

Access - Decision-making patterns

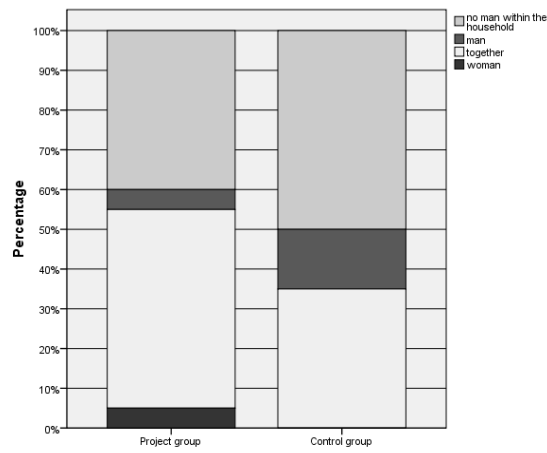


Figure 43: Decision-making pattern about money spending

Stability

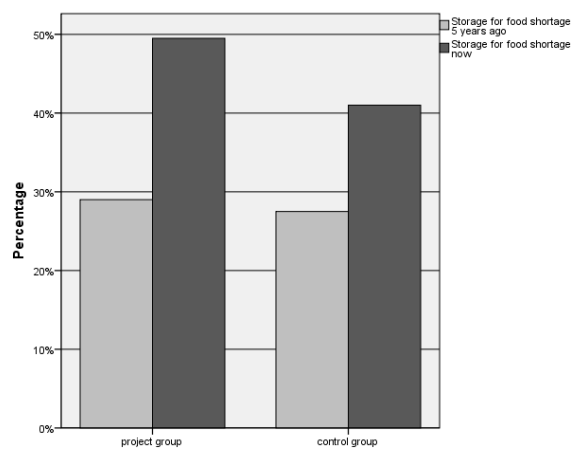


Figure 44: Share of storage for times of food shortage