STUDY

Sustainable Agriculture

Key to Inclusive Rural Transformation

A Comparative Study Based on Empirical Evidence from 20 Years of MISEREOR Partner Efforts in Uganda

Commissioned by MISEREOR/KZE

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Preface

During the last years, more and more countries in sub-Saharan Africa have opted for large-scale agriculture and tried to attract foreign investors as a means to 'modernise' the agricultural sector. Within this vision of structural rural transformation, small-scale farmers are perceived as merely subsistence farmers with generally low potential for agricultural intensification and market integration. The necessary potential to commercialize is ascribed to only a minority of them. The model privileged by policy makers and international agencies to integrate small-scale farmers into 'modern' agriculture is contract farming (also known as outgrower scheme) preferably linked to private 'nucleus farms' or manufacturing sites of agricultural primary products. The latter are expected to provide necessary services to the contracted small-scale farmers such as farm input delivery, agricultural extension and market access. The underlying concept of intensification follows the well-known 'green revolution' with its capital-intensive approach of using high-yielding varieties, synthetic fertilisers as well as chemicals to control pests, weeds and diseases.

However, there are great concerns among farmers, civil society, scientists and development practitioners about the implications of this privileged policy option, especially for those African countries where the majority of the populations still live in rural areas and build their livelihoods on farming. A key question largely neglected in this option, and yet to be answered by its proponents, certainly is: 'Which sector – other than agriculture – will be able to absorb the released agricultural labour force and generate adequate employment assuring their livelihoods?'

Over the last 20 years, together with Ugandan partner organisations and small-scale farmers, Misereor has been engaged in developing a different model to intensify agriculture in an environmentally sound manner. This model relies on the small-scale farmers' own ambitions and strength, on their farming knowledge and skills. Based on existing farming systems and on the specific environmental context, it is founded on agro-ecological principles of farming and diversification, enabling small-scale farmers to better manage risks linked to rainfall variability and market fluctuations. This inclusive model of agricultural intensification enables the majority of small-scale farmers to overcome rural poverty. It is thus a viable alternative to the model of rural transformation as described above.

In 2004 and 2005, Misereor had commissioned a first study on the impact of seven partner organisations working at farmers' households level with this 'sustainable agriculture approach' in Uganda. The results of this first study showed that small-scale farmers economically evolved much better compared with a reference group. By implementing sustainable agriculture, small-scale farmers could considerably increase their yields, improve their food security and raise their monetary incomes.

Since the overall framework conditions for agriculture have evolved tremendously over the last decade, Misereor commissioned a second related study in 2015. This time, sustainable agriculture farmers were compared not only with a reference group but also with tea outgrowers under contract with tea processing plants. Since the latter model builds on specialisation in a high-market value crop, it stands for the above-mentioned privileged development model and perfectly contrasts with the one favoured by Misereor and its rural partners in Uganda. The main results of this study are presented in the publication at hand. The findings provide ample evidence to rethink the policy makers' privileged development model and rather promote an environmentally sound and socially inclusive model on the basis of sustainable agriculture.

We wish you an interesting and inspirational read!

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Managing Director
International Cooperation

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Middle East and Africa

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Abbreviations

ASDISP	Agricultural Sector Development Strategy and Investment Plan
BMZ	Federal Ministry for Economic Cooperation and Development
CA	Conservation Agriculture
CAADP	Comprehensive Africa Agriculture Development Programme
FAO	Food and Agriculture Organisation of the United Nations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IMF	International Monetary Fund
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MDGs	Millennium Development Goals
NAADS	National Agricultural Advisory Services
NFS	National Fertilizer Investment Strategy and Investment Plan
PPP	Public-Private Partnership
PRA	Participatory Rural Appraisal
SA	Sustainable Agriculture
SAP	Structural Adjustment Programme
SDGs	Sustainable Development Goals
SEWOH	Special Initiative “One World, No Hunger”
SIF-SLM	Sustainable Land Management Investment Framework
SLM	Sustainable Land Management
SUN	Scaling-up Nutrition Movement

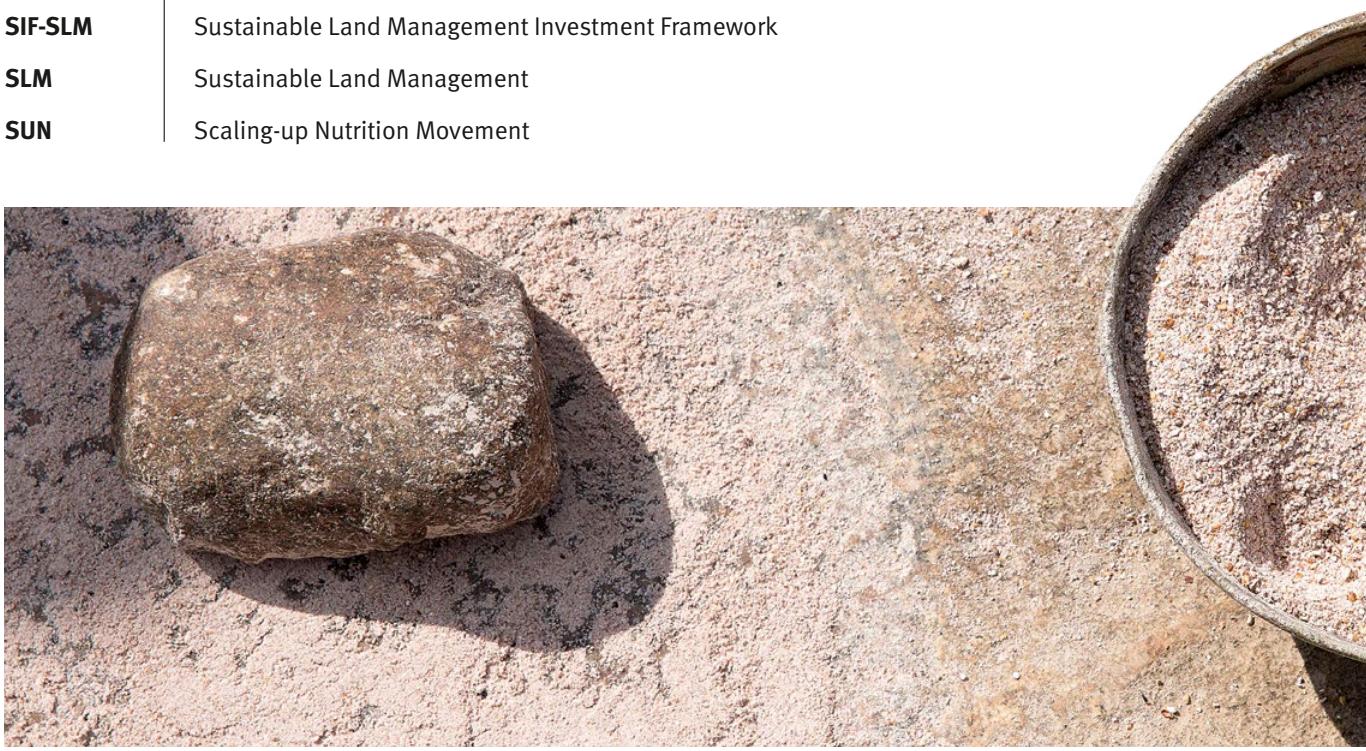
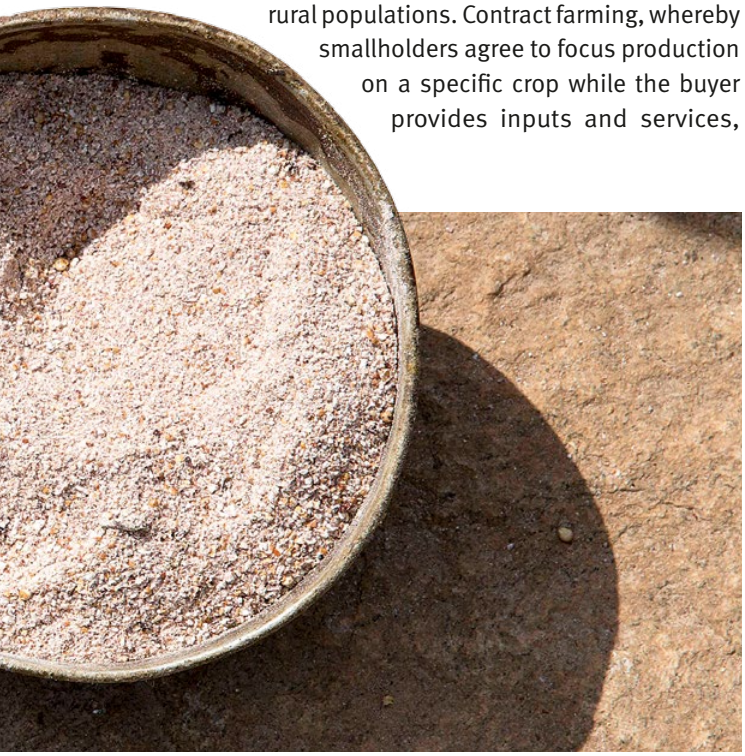


Photo: H. Schwarzbach/MISEREOR

Executive Summary

After decades of negligence, agriculture and rural development are back on the international agenda. Global population growth, increasing demand in emerging economies and scarcity of fossil energy are expected to lift world market prices for food to constantly higher levels than ever before. While this poses a huge challenge to consumers worldwide, it also entails opportunities for producers in developing countries who paradoxically are most affected by hunger and undernourishment today. The new framework conditions thus offer an unprecedented chance for fundamental changes in the livelihoods of rural populations, also referred to as *Structural Transformation*. The question how this process can be stimulated, facilitated and accompanied is subject to considerable debate.

While both the Ugandan and the German government acknowledge the central role of agricultural growth in reducing poverty, enhancing food security and triggering structural transformation, their strategic documents lack a coherent vision for the management of the latter. On the one hand, German development policies mirror a hesitant consideration of approaches that either accept a limited eviction of smallholders from agriculture or rather aim at their socially inclusive commercialisation. On the other hand, Ugandan agricultural policies fail to address the small-scale farming sector's complexity when single-handedly relying on large-scale enterprises for the market integration of rural populations. Contract farming, whereby smallholders agree to focus production on a specific crop while the buyer provides inputs and services, are a key element in the policy frameworks of both governments.



MISEREOR has supported partner organisations in Uganda in their efforts to empower smallholders, raise and diversify farm productivity and promote sound management of natural resources for over 20 years. *Sustainable Agriculture (SA)* has been the guiding principle of joint project interventions all along. The present study is based on two long-term evaluations conducted in ten Ugandan districts in 2005 and 2015. Thereby, the more recent survey not only covered project participants and a conventionally farming reference group but also smallholders assigned to tea outgrower schemes. In this way, MISEREOR aims to contribute empirical evidence to the question how structural transformation can be managed in an economically viable, environmentally friendly and socially inclusive manner and thus, with particular benefit for the rural poor.

The results show that external factors such as drought and crop diseases generally present the main hazards for all three groups of farmers. Tea farmers, due to their specialisation, are particularly exposed to market-related risks. Low farm output prices, high input costs and insufficient service provision by the processors result in the far-reaching loss of the promised benefits from contract farming.

Scarcity of land and labour pose further challenges to all smallholders. Through inheritance, plots become gradually fragmented which increasingly drives the rural youth towards urban centers. This reduces the availability of external farm labour which thus is only affordable for the better off. Accompanying services especially needed by the underprivileged households to overcome such obstacles on the way to agricultural intensification are not provided sufficiently by the responsible public or private institutions. Under the comprehensive advisory system deployed by MISEREOR partners however, locally-adapted means of sustainable farm management proved to offer a viable alternative to conventional or industrial agriculture.

Decreasing plot sizes affected many earlier successes by MISEREOR partners in enhancing agrobiodiversity. Moreover, average staple crop production declined dramatically in the due to the banana wilt disease. Nonetheless, efforts in promoting organic pest management and soil fertility management methods resulted in considerable gains on the less productive farms. Similar trends are observable for livestock whereby SA adopters own significantly more than the other two groups. Chemical inputs, albeit increasingly used by

the better off among all farmers, did not prove to have a positive impact on crop yields.

Further remarkable improvements have been made in the field of nutrition as diets within SA farmer households became much more diverse and domestic practices concerning water and sanitation were improved. Apart from education and crop diversity, small ruminants, agroforestry and manure management proved to be the main drivers of enhanced availability and quality of food. As a result, the vast majority of households embracing manifold, integrated and environmentally sound production systems can be considered food secure.

The monetary advantage of sustainable agriculture over reference and tea farmers manifests itself in terms of both, home consumption values and cash income from farming activities. Thereby, the benefits are most evident among the lower income groups and on farms of less than two acres as these comprehensively manage integrated production systems by the sole utilization of family labour. Education, marketing and access to land are factors contributing to increased income across all groups. Due to their favourable situation, SA farmers spend less on basic aliments, are more able to invest into non-food items and to build up savings. Diversification thus is not only a measure of risk spreading but can entail higher dividends than focusing on export cash crops as well.

In short, the SA approach managed to mitigate negative external impacts on smallholders in the fields of agrobiodiversity, staple crop productivity and livestock. It successfully addressed all pillars of food security through increased production, higher incomes and diversified nutrition. With regard to productivity and revenues, it proved to be particularly beneficial for the less resourceful households and thus can be characterized as inherently "pro-poor".

These findings demonstrate that environmentally friendly and socially inclusive means of agricultural intensification can very well trigger rural growth and therefore have the potential to facilitate structural transformation. Furthermore, they are definitely able to compete with outgrower schemes in terms of profitability, by carrying less risk. Another advantage is the risk spreading character of diversified farming systems over specialized means of production that highly depend on external inputs. However, an *inclusive transformation* by means of sustainable agriculture will only realize its full potential under more favourable institutional and economic framework conditions. Hence, MISEREOR urges the Ugandan and the German government to review their relevant policies and commit to the vision of inclusive rural transformation.

Photo: H. Schwarzbach/MISEREOR

Sustainable agriculture projects in Uganda support farmer-controlled seed systems.

Zusammenfassung

Nach Jahrzehnten der Vernachlässigung stehen Landwirtschaft und ländliche Entwicklung wieder auf der internationalen Agenda. Das globale Bevölkerungswachstum, die steigende Nachfrage in den Schwellenländern sowie die Verknappung fossiler Energieträger werden die Weltmarktpreise für Nahrungsmittel auf ein konstant höheres Niveau heben als jemals zuvor. Für Konsumenten weltweit bedeutet dies einerseits eine ungeheure Herausforderung, andererseits liegt darin jedoch eine Chance für Kleinbäuerinnen und Kleinbauern in den Entwicklungsländern, die heute paradoxerweise am stärksten von Hunger und Mangelernährung betroffen sind. Die neuen Rahmenbedingungen bieten daher eine nie dagewesene Möglichkeit für eine grundlegende Veränderung der ländlichen Lebensverhältnisse, auch unter der Bezeichnung *Strukturwandel* bekannt. Die Frage, wie dieser Prozess angestoßen, erleichtert und begleitet werden sollte ist Gegenstand einer intensiven Debatte.

Sowohl für die ugandische als auch für die deutsche Regierung leistet landwirtschaftliches Wachstum einen zentralen Beitrag zur Armutsbekämpfung, zur Stärkung der Ernährungssicherung sowie als Initiator des ländlichen Strukturwandels. In den relevanten strategischen Vorgaben fehlt jedoch eine klare Vision zu dessen Gestaltung. In der deutschen Entwicklungspolitik spiegelt sich vielmehr eine zögerliche Abwägung zwischen verschiedenen Ansätzen wider, die entweder eine gewisse Verdrängung kleinbäuerlicher Betriebe in Kauf nehmen oder eher auf eine sozial inklusive Kommerzialisierung derselben abzielen. Die ugandische Landwirtschaftspolitik verpasst es ihrerseits, in ihren Überlegungen die Komplexität des kleinbäuerlichen Sektors zu berücksichtigen, indem sie sich zur Marktintegration der ländlichen Bevölkerung vor allem auf große Agrarunternehmen verlässt. Vertragsanbau, im Zuge dessen sich die Produzenten zum Anbau eines bestimmten Produkts verpflichten, während der Abnehmer die notwendigen Inputs und Services bereitstellt, ist dabei ein Kernelement der Politik beider Regierungen.

MISEREOR unterstützt seine ugandischen Partner seit 20 Jahren darin, die Produktion kleinbäuerlicher Betriebe zu steigern und zu diversifizieren, für eine schonende Ressourcennutzung einzutreten sowie gesellschaftliche Handlungsspielräume der Landbevölkerung zu erweitern. *Nachhaltige Landwirtschaft* ist dabei das Leitbild gemeinsamer Projektinterventionen. Die vorliegende Studie basiert auf zwei Programmevaluierungen, die 2005 und 2015 in zehn Distrikten des Landes durchgeführt wurden. Letztere umfasst nicht nur eine konventionell produzierende Referenzgruppe, sondern auch Teilnehmende eines Vertragsanbaus für Tee. Ziel der Studie ist die Bereitstellung empirischer Belege dafür, wie der ländliche Strukturwandel in Entwicklungsländern – unter besonderer Berücksichtigung der armen Bevölkerungsteile – ökonomisch tragfähig, umweltfreundlich und sozialverträglich gestaltet werden kann.

Die Ergebnisse zeigen, dass insbesondere externe Faktoren wie Dürre und Pflanzenkrankheiten die Hauptrisiken für alle Befragten darstellen. Teebauern sind aufgrund ihrer Spezialisierung zusätzlich marktbasierten Risiken ausgesetzt. Geringe Erzeugerpreise, hohe Investitionskosten sowie unzureichende Servicebereitstellung durch die jeweiligen Vertragspartner führen zum weitgehenden Verlust der im Zuge von Vertragslandwirtschaft versprochenen Vorteile.

Die Verknappung von Land und Arbeitskraft stellt für alle kleinbäuerlichen Haushalte eine weitere Herausforderung dar. Durch Erbfolgeregelungen werden individuelle Parzellen immer kleiner. Junge Menschen verlassen daher zunehmend die ländlichen Gebiete, was die Verfügbarkeit an Arbeitskräften mindert und den Einsatz von Lohnarbeit nur für die Bessergestellten erschwinglich macht. Flankierende Dienstleistungen, welche es auch den unterprivilegierten Betrieben ermöglichen würden, ihre Produktion zu intensivieren, werden von den zuständigen öffentlichen und privaten Akteuren nur notdürftig bereitgestellt. Unter dem von MISEREOR-Partnern angebotenen Beratungssystem erwiesen sich lokal angepasste nachhaltige Anbaumethoden als tragfähige Alternative zur konventionellen und industriellen Landwirtschaft.

Viele frühere Erfolge der Partnerorganisationen im Bereich Agrobiodiversität wurden durch die Landfragmentierung relativiert. Eine Pflanzenkrankheit sorgte außerdem für drastische Produktionseinbußen bei den als Grundnahrungsmittel verwendeten Bananen. Dennoch konnten beachtliche Ertragszuwächse erzielt werden, vornehmlich durch die Verbesserung der Bodenfruchtbarkeit und durch die Förderung der Kleintierhaltung im Verbund mit Agroforstwirtschaft. Diese wurden insbesondere auf den bislang weniger produktiven Farmen sichtbar. Ähnlich verhält es sich mit Viehbesitz, dem insbesondere nachhaltig ausgerichtete Betriebe einen großen Stellenwert einräumen. Chemische Produktionszusätze werden zwar zunehmend von den Bessergestellten in allen Gruppen genutzt, führen aber nachweislich nicht zwangsläufig zu höheren Erträgen.

Photo: L. Bachmann/MISEREOR

Goats make best use of fodder trees, hence encourage agroforestry.

Weitere Fortschritte wurden im Bereich Ernährung gemacht. Mahlzeiten in den teilnehmenden Haushalten konnten merklich diversifiziert und häusliche Praktiken bezüglich Wasser und Hygiene verbessert werden. Neben dem Zugang zu Bildung zeigten sich vor allem die höhere Nutzpflanzenvielfalt und der biologische Pflanzenschutz für die verbesserte Verfügbarkeit und Qualität von Nahrungsmitteln und Mahlzeiten verantwortlich. Somit kann die große Mehrheit der nachhaltig produzierenden Haushalte als ernährungssicher eingestuft werden.

Die finanziellen Vorteile nachhaltiger Landwirtschaft zeigen sich sowohl im monetären Wert der Subsistenzproduktion als auch in den Bareinnahmen der jeweiligen Betriebe. Sie werden vor allem im Vergleich der einkommensschwachen Haushalte und kleinen Farmen von weniger als 0,8 ha sichtbar. Letztere können die geförderten integrierten Betriebssysteme unter dem ausschließlichen Einsatz von Familienarbeitskraft managen. Bildung, kommerzielle Vermarktung und Zugang zu Land tragen außerdem zu höheren Einkommen bei. Vor diesem Hintergrund geben Projektteilnehmende weniger für Grundnahrungsmittel aus und sind daher eher in der Lage, anderweitig zu investieren sowie Rücklagen zu bilden. Diversifizierung ist daher nicht nur als Maßnahme zur Risikostreuung zu verstehen, sondern erweist sich zum Teil als profitabler als die einseitige Spezialisierung auf bestimmte Exportprodukte.

Insgesamt konnte nachhaltige Landwirtschaft negative Einflüsse auf Nutzpflanzenvielfalt, Grundnahrungsmittelproduktion und Tierhaltung wirkungsvoll abschwächen. Sie stärkte alle Säulen der Ernährungssicherung durch gesteigerte Produktion, höhere Einkommen und vielseitigere Mahlzeiten. Außerdem erwies sie sich insbesondere für marginalisierte Haushalte als effektiv und kann daher als grundsätzlich armutsorientiert bewertet werden.

Die Ergebnisse zeigen, dass umweltfreundliche und sozialverträgliche Methoden landwirtschaftlicher Intensivierung Wirtschaftswachstum im ländlichen Raum initiieren und somit den dortigen Strukturwandel erleichtern können. Außerdem ist sie im Vergleich zur Vertragslandwirtschaft in Hinblick auf Profitabilität durchaus konkurrenzfähig und birgt zudem geringere Risiken. Der risikostreuende Effekt von agrarökologischer Vielfalt ist ein weiterer Vorteil. Ein armutsorientierter und somit *inklusiver Strukturwandel* wird sein volles Potenzial allerdings nur unter verbesserten institutionellen und ökonomischen Rahmenbedingungen entfalten können. MISEREOR fordert daher die ugandische und die deutsche Regierung auf, ihre relevanten Strategien zu überarbeiten und eindeutig an der Vision eines inklusiven Strukturwandels auszurichten.

Zusammenfassung

1 Introduction

1.1 Diverging Pathways to Rural Transformation

After decades of negligence, agriculture and rural development are back on the international agenda. Global population growth, increasing demand in emerging economies and scarcity of fossil energy reserves are expected to lift world market prices for food products to a constantly higher level than ever before. While this means a huge challenge to consumers worldwide, it also entails opportunities for small-scale farmers in developing countries who paradoxically are most affected by hunger and undernourishment today. In most parts of the global South, agriculture still is the backbone of national economies. Therefore, the changed framework conditions provide an unprecedented opportunity for a fundamental change in the livelihoods of rural dwellers, also referred to as *structural transformation*. The question whether this entails the transition from rural-agricultural to urban-industrial societies and thus, a replication of the development pattern experienced by the wealthy and currently emerging nations, is a subject of considerable debate. (CUMMING ET AL. 2014, RAUCH ET AL. 2015) Nonetheless, the need to stimulate and support agriculture-led growth to reduce poverty and eradicate hunger is equally recognized by governments, their development partners and civil society.

The renewed interest on the matter is also reflected in the Sustainable Development Goals (SDGs), a broad range of intergovernmental initiatives and agreements as well as increased involvement of the private sector. The German government through the Federal Ministry of Economic Cooperation and Development (BMZ) has devoted substantial resources to its 2014 special programme "One World, No Hunger" (SEWOH) to enhance global food security, promote agricultural innovations and accompany structural transformation among others in more than ten developing countries.

Since the end of civil war in 1986, Uganda has seen remarkable economic growth rates, based on far-reaching deregulation of the agricultural sector and intensive promotion of export crops. Still, 18M rural residents live from less than US$ 1 per day. Against the background of 3.3% annual population growth, the urgency for agricultural intensification becomes even more apparent (WORLD BANK 2016). In order to achieve this, the government heavily relies on foreign capital provided by large-scale private enterprises. While public investment into the country's smallholder farming sector remains sparse, *contract farming* arrangements are the measure of choice to incorporate the local population and create agricultural growth poles. Thereby, smallholders specialize in producing a certain commodity at a specified volume and quality while the processor assures to buy the yield at a more or less predetermined price and provides necessary inputs and services.

MISEREOR has supported partner organisations in Uganda in their efforts to empower smallholders, raise and diversify farm productivity and promote sound management of natural resources for more than 20 years. *Sustainable Agriculture (SA)* has been the guiding principle of joint project interventions all along. The present study is based on two comprehensive long-term programme evaluations carried out in 2005 (BACHMANN 2005) and 2015. The latter not only included a conventionally producing reference group but also contract farmers assigned to various tea outgrower schemes. In this way, MISEREOR aims to contribute empirical evidence to the issue of how agricultural growth and structural transformation should be facilitated in order to ensure economically viable, environmentally sound and socially inclusive outcomes with particular benefit for the rural poor.

> *A farming system can be considered sustainable if it ensures long-term income for the rural population and maintains land productivity without having adverse effects on the ecosystem or the people.*
>
> MISEREOR 2008

1.2 Conceptual Basics and Selection of Case Studies

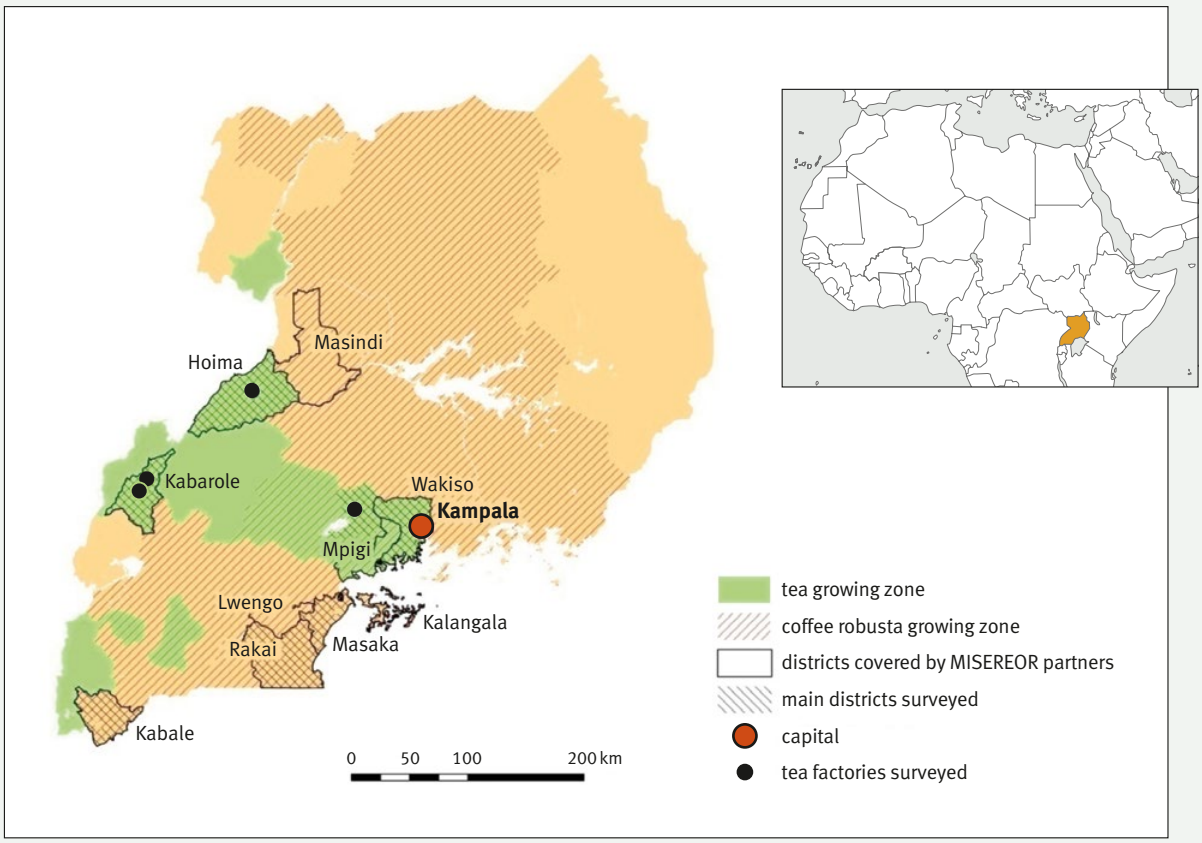
In MISEREOR's understanding „a farming system can be considered sustainable if it ensures long-term income for the rural population and maintains land productivity without having adverse effects on the ecosystem or the people." (IBID. 2008) According to catholic social teaching this entails righteous access to natural resources and respectful and gentle interaction with our natural environment. Another guiding principle is self-determination. MISEREOR thus supports initiatives of the poor and marginalized which aim for self-reliance, social inclusion and question the universal validity of established development blueprints. At the same time, MISEREOR does not prescribe specific alternative concepts. In the case of agriculture and rural development this means that the final decision-making authority over farming systems remains with the growers themselves (IBID.).

The study at hand examines the impact of six MISEREOR partner organisations working in ten districts of Uganda (s. Fig. 1). The two locations close to Kampala can be described as peri-urban, the other eight are rural settings. As stated in the cross-organisational standardized logical framework that ensures coherence of partner efforts, all implemented projects share the four broad objectives to a) enhance food security, b) increase smallholder incomes, c) better participants' health and d) improve gender relations. More specifically, these shall be achieved through:

- Improved and diversified crop yields
- Sustainable management of natural resources
- Increased biologic and economic productivity of livestock
- Resilient and empowered families and farmer groups

On a technical level the projects promote a diverse range of practices including soil and water conservation, integrated pest management, agroforestry, composting, manure and other organic fertilizers as well as integrated livestock husbandry. Programmes are structured into two distinct cycles of three years

Figure 1:
Overview map of field survey 2015



Data: FAO 2013, Mugoya 2015 and Kretschmer 2015

each. In the first phase intensive advisory services are provided to the farmers focusing on basic principles of sustainable agriculture and food security. In the second cycle services are downsized and priority is given to trainings on food processing and marketing. Health and gender issues are addressed throughout the two phases. The average number of households reached by a single project over a three year period is 700. Apart from one organisation that started five years ago, all partners have been working with local communities for more than 20 years covering between one and 10% of the respective district's population. Moreover, MISEREOR partners jointly advocate for a policy framework supporting small-scale farming and sustainable agriculture.

Besides a reference group of non-project participants, farmers assigned to tea outgrower schemes were interviewed as a second comparative sample. The key reasons as to why tea growers were selected refer to their production system's similarity in terms of land size, labour requirements, use of inputs and level of mechanization among others.

1.3 Aim and Structure of the Study

The immediate purpose of this assessment is to provide an opportunity for all stakeholders to review the progress of SA programmes made in the last 20 years. It shall analyse MISEREOR partners' efforts in Uganda and offer guidance on how initiatives promoting sustainable agricultural intensification and rural development can be supported in the future. In addition, the comparison with tea outgrowers is meant to inform and advise political decision makers. In the recent years, both the Ugandan and the German government have been increasing their cooperation with the private sector in the field of rural development. Integrating smallholders into high-value export markets through contract farming is perceived as a key to attract foreign direct investment, increase rural incomes and stimulate agricultural growth. The underlying assumption is that specialisation is a prerequisite for the development of the smallholder sector. MISEREOR's work on the other hand, focuses more holistically on food security, natural resource management, and social inclusiveness as presented above. Data analysis will reveal the benefits of the two approaches for the farmers themselves. Hence, MISEREOR expects the findings of this study to provide new perspectives on the controversial issue of how to facilitate agricultural intensification and accompany structural change.

The following chapter forms the basis of this investigation as it provides a brief introduction to Uganda's political and economic development since independence and agriculture's altering contribution to it. It pays particular attention to the country's growing tea sector and the role of outgrower schemes therein. The third part reviews the political debate on rural development and agricultural intensification in Uganda and the public foreign aid institutions of Germany. After a brief description of the field survey's methodology, the main section of this report presents the respective findings, starting with a description of the challenges encountered by small-scale farmers at the local level. This is followed by an evaluation of the immediate output of project intervention in terms of improved farming systems and an assessment of outcomes with regard to crop and livestock productivity, food security and wealth creation. Concluding policy recommendations are derived from the empirical results thereafter.

Photo: L. Bachmann/MISEREOR

Good composting practice under a shady tree

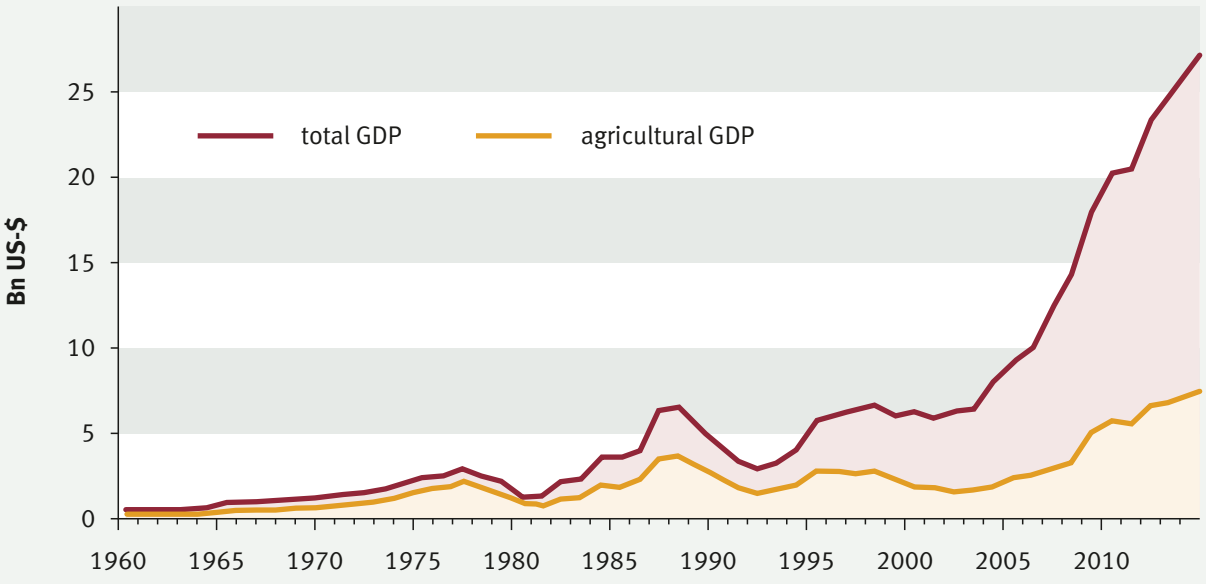
2 The Ugandan Context

2.1 Economic and agricultural Development since Independence

Uganda was a predominantly agrarian society when it gained independence in 1962. Farming accounted for more than half of the national GDP and provided a livelihood to 95% of the population (WORLD BANK 2016). Its first independent government was characterized by a rivalry between Prime Minister Milton Obote and president and traditional leader Kabaka Mutesa II of Buganda. In an attempt to consolidate power and establish a one-party system Obote adopted socialist rhetoric and nationalized the vast majority of private enterprises in 1970. One year later he was overthrown in a military coup by his former protégé Idi Amin who applied similar measures when expelling the local Asian community and seizing their property. As a result, the country's marginal industries perished completely and agriculture's share in the national GDP reached over 70% (s. Fig. 2). When Amin began to squeeze the agricultural sector to maintain his supporters in the army, farmers retreated from commercial production or started smuggling their crop to Kenya. After eight years of state terrorism he was eventually defeated by Tanzanian forces in 1978. Milton Obote returned from exile and became president in a contested election three years later. Despite initial attempts to revive Uganda's economy with the help of international donors, his government's military raids to destroy opponents resulted in a greater loss of life than during Amin's rule. He was toppled by rebel leader and current president Yoweri Museveni in 1986 (BYRNES 1992).

After 15 years of general economic decay the Museveni government's policies from 1988 onwards focused on stabilization and rehabilitation by embracing the structural adjustment agenda of the World Bank and the IMF. This included currency devaluation to damp inflation, privatization of parastatal enterprises and liberalization of producer prices through elimination of export quotas and taxation (FAO 2013). In order to cope with the drawbacks of market integration, the government started to promote diversification of the country's export base. Since the early 1990s this new policy environment has ushered an era of solid economic growth, with mean GDP expansion rates of 6.5% (s. Fig. 2). Today, Uganda can be considered a highly liberalized economy with minimum state interven-

Figure 2:
Agriculture's contribution to economic development



Data: World Bank 2016

Photo: H. Schwarzbach/MISEREOR

Ms. Judith explains how successfully she developed her 3 acres farm based on sustainable agriculture.

tion. Only low tax rates on traditional export crops were retained and protective import tariffs have been introduced for selected industries. The global economic crisis 2008 hurt Uganda's exports but overall impact was limited and unlike many other developing countries no food riots[1] occurred at that time (BENSON ET AL. 2008). As of late, economic growth appears to slow down not exceeding 4% in the last five years (WORLD BANK 2016).

The notable economic progression was mainly based on export promotion policies. Since their introduction export's share in national GDP has doubled, currently standing at 18%. In recent years, more than half of Uganda's external revenues were generated through trade with neighbouring countries while only one fifth of returns were acquired from the EU. Agricultural commodities still make up the bulk of goods leaving the country. Besides traditional export crops like coffee, tea, cotton and tobacco which generate one fourth of returns fish, horticultural crops and flowers have become more important. Coffee remains essential as it accounted for 18% in 2014 alone. On the other hand, Uganda mainly imports high value manufactured goods such as petroleum products (23%), vehicles (9%) and pharmaceuticals (6%), more than half of which are obtained from Asian trade partners. Changed urban consumption patterns also led to a substantial increase of rice and wheat imports since the 1990s. Unsurprisingly, the country's trade balance has been negative as import expenditures have been constantly outgrowing export revenues for the last two decades (UBOS 2015).

Hence, agriculture remains the backbone of the Ugandan economy. Despite the considerable growth of services and industries over the last three decades, farming still constitutes 25% of the national GDP. It employs 72% of the working population, the vast majority as small-scale producers with average land holdings of 4 acres. The share of rural dwellers living from less than US$ 1 per day has seen a remarkable decline from 60% in 1992 to 22% in 2013 (WORLD BANK 2016). Yet, agricultural growth has been lacking behind that of other sectors and policy incentives to fuel the rural economy did not live up to the expectations. The reasons are manifold and include lack of market integration due to poor infrastructure and high transport costs, inefficient value chains relying on middlemen as well as a lack of political will to invest in agriculture (s. Section 3.3). As a result, most staple crops have been traded below world market prices and thus did not offer sufficient market opportunities for local producers. While these certainly exist in the case of export-oriented cash crops, the profit margins are often captured by key-actors in the upper sections of the respective value chains (s. Section 2.2) (FAO 2013). Accordingly, agricultural growth has thus far failed to trickle down to producers as 89% of the nation's poor live in rural areas (UBOS 2015).

However, agriculture is expected to retain its essential role for the nation's well-being in the future. Within the last 20 years Uganda's population has almost doubled, amounting to 37.8M people today (WORLD BANK 2016). Growing by one of the fastest rates in Africa it is expected to reach over 100M in 2050 (UN DESA 2004). Hence, there is an urgent need for agricultural intensification to feed the increasing population, avoid expansion of farming activities into ecologically fragile areas and prevent conflicts over access to land. Although this certainly is a challenge for the country's sustainable development it also presents a chance for small-scale farmers in terms of rising demand for their produce. In spite of high fluctuations these new incentives already become apparent when comparing general inflation rates with consumer price development for food crops over the last 20 years (s. Fig 3, p.16). While the latter have lacked behind headline inflation by -29% between 1995 and 2004, the situation reversed in the last decade as the food price index surpassed overall price increase by an average 35%. Besides growing numbers of domestic consumers, external trends such as strong regional demand during the South Sudanese struggle for independence and generally increasing world market prices have been acting as additional

[1] Riots occurred during the "Walk to Work Protests" in April 2011 directed against inflating food and fuel prices as well as the confinement of opposition leaders.

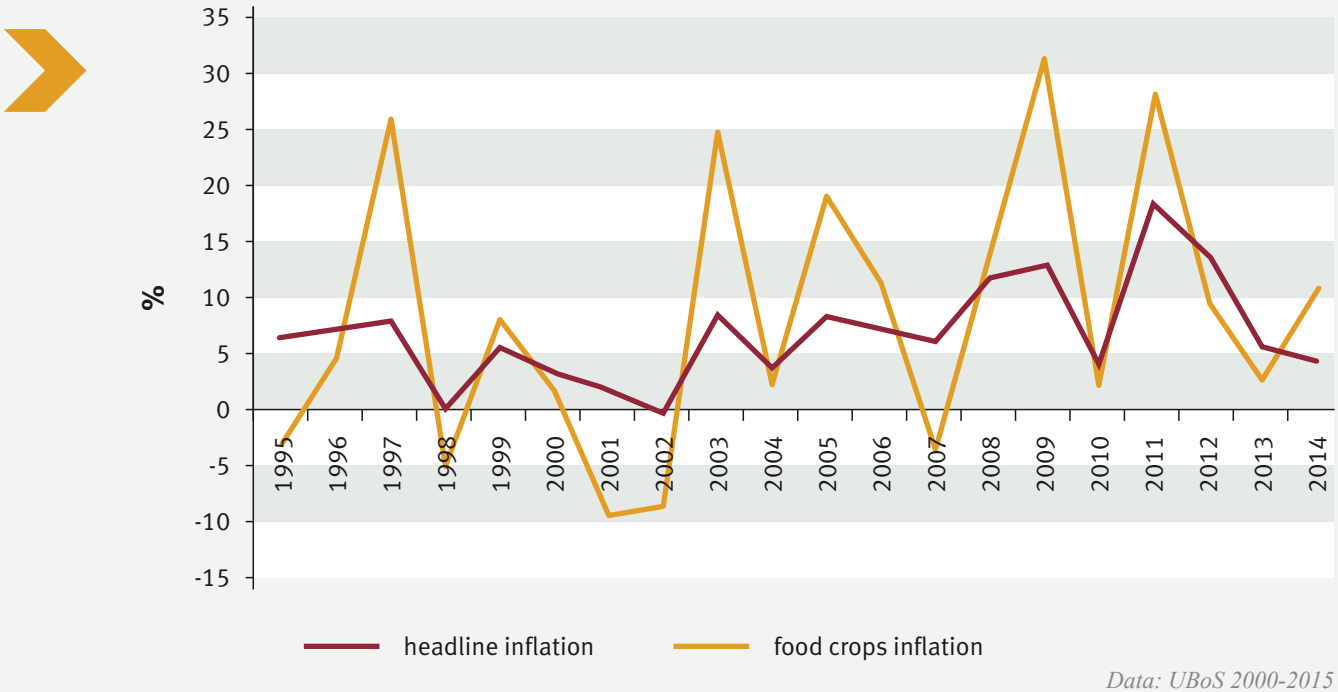
drivers. Thus far only some 25% of households have benefitted directly from the changed macro-economic environment since the high transaction costs of the staple crop market restrict surplus producers from reaping the benefits. Yet, the improved framework conditions offer an unprecedented opportunity for employment intensive agricultural growth and poverty eradication (BENSON ET AL. 2008).

2.2 The Tea Sector and the Role of Outgrower Schemes

Camellia sinensis was introduced to Uganda at the botanical gardens of Entebbe in 1909. Much of the country offered favourable conditions for cultivation given temperatures of 20-25°C and annual rainfall of 1000-1500mm at 1500m a. s. l. Commercial production began in the late 1920's and tea developed into the country's main estate crop two decades later. Since most plantations were established by European or Asian settlers during the colonial era, African growers were underrepresented in the industry in the first years of independence. Hence, the Obote administration started to encourage tea production among native smallholders in 1966 and set up the first cooperative factories. Yet, the sector was gradually politicized, marketing and export were subordinated to a state monopoly and embezzlement and corruption increasingly affected overall economic performance (BRANDT 2007). When Idi Amin seized power and confiscated Asian property, tea farming became a sole instrument of rent-seeking. By the end of his rule in 1978 national production had crumbled to one tenth of its initial capacity (s. Fig. 4). After a short-lived increase under the second Obote govern-ment overall economic decay continued during the years of civil war.

From 1986 throughout the 1990s the Museveni government ran a number of rehabilitation and development programmes for the sector. Marketing was liberalized in 1990 and state-owned companies were sold four years later. Export quotas, taxes and levies were abolished altogether. These policies triggered significant producer price increases and in 1998 national output for the first time surpassed its 1972 record (s. Fig. 4). Today, Uganda is the third biggest African producer behind Kenya and Malawi and tea sales account for 4% of its total export earnings. Similar to its main competitor Kenya, the Ugandan tea industry

Figure 3:
Consumer price inflation for food crops and general headline inflation



Data: UBoS 2000-2015

is dominated by smallholders who own 54% of the area under cultivation and sell their crop either to large-scale estates or farmer-owned processing lines. Yet, they only amount to 28% of national production. Ugandan tea farming directly employs 62,000 people and indirectly supports the livelihoods of 500,000 dependents (FAO 2012). Currently, the tea belt extends from the Lake Victoria Crescent to the lower slopes of the Rwenzori Mountains and the Western Rift Valley with the most suitable conditions in Kabarole and Bushenyi (s. Fig. 1, p.12).

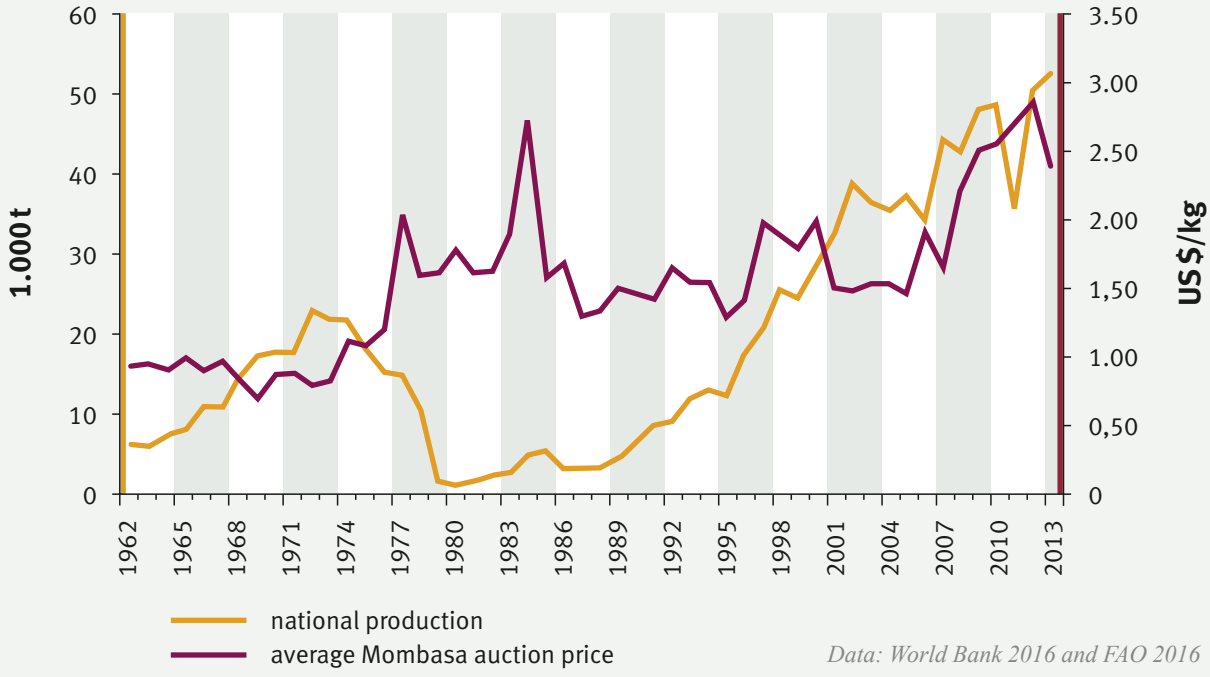
The future of the Ugandan tea sector must be assessed from different angles. On the one hand, it has lots of untapped potential as output and efficiency still lack behind that of neighbouring Kenya. Key issues include inferior quality, high transport costs, lack of specific research and extension services as well as deficiencies in energy supply and labour availability. EZRA ET AL. 2014 identify institutional failure and the resulting absence of a comprehensive tea policy as major obstacles to investment for both, large-scale enterprises and smallholders.

On the other hand, increasing rainfall and temperature in the cause of global warming are projected to dramatically reduce tea productivity in the country's lower altitudes. According to EITZINGER et al. 2011, agro-ecologic suitability will decrease by 20 to 40% until 2050, resulting in the complete drop out of today's lower potential areas. Nonetheless, the government's official target provides to license two new processing lines in Kabale and Masaka District until 2018, anticipating additional foreign exchange earnings of 160M US$ and labour opportunities for more than 100,000 individuals (MAAIF 2012). Each of them will require some 600ha of land, most of which is already utilized by small-scale farmers.

The tea value chain can be described as buyer-driven and vertically integrated (s. Fig. 5, p.18). A total of twelve tea processing and exporting companies supply foreign and domestic markets which implies, that producers do not have many options to sell their crop. Moreover, acreages need to be located within 20km radius from the factory to guarantee efficient and sound processing of green leaves. Most smallholders sell to factories directly with varying arrangements regarding transport costs. After processing, exporters sell in bulk at the Mombasa auction where most of East Africa's tea is marketed. Unlike in the Kenyan industry, brokers are rarely involved. Whereas average auction prices recently fluctuated between 2.00 and 3.00US$/Kg, Ugandan tea merely fetched some 1.50 to 2.00US$/Kg since the early 1990s (EZRA ET AL. 2014).

Assuming average prices of 300USh/Kg at farm gate and 1.75US$/Kg at the auction we can calculate

Figure 4:
Ugandan tea production and Mombasa auction prices

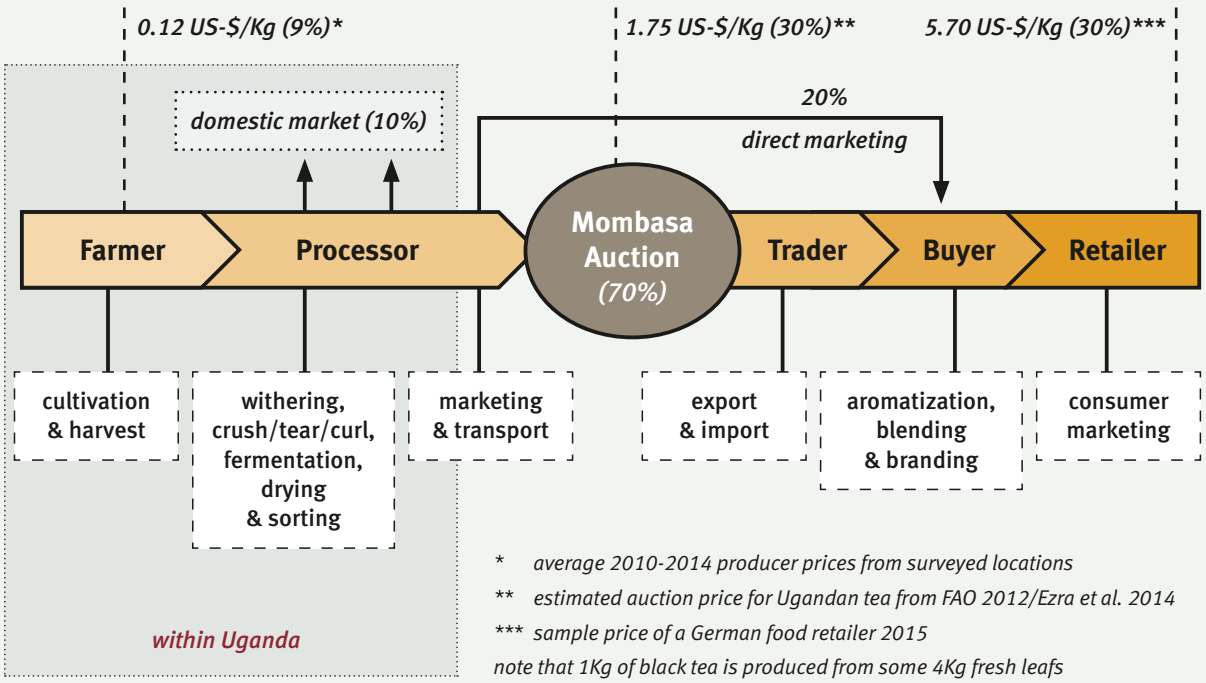


Data: World Bank 2016 and FAO 2016

the grower's share at 9% of the consumer price and 30% of the auction price (s. Fig. 5). A 2012 FAO study suggests that farm gate proceeds could be up to 25% higher, if the value chain would be organized more efficiently and the profits generated were distributed in a more equitable manner (s. Annex 1). Accordingly, tea companies capture "excessive" margins despite substantial costs for transport, border customs, warehouse rents and auction fees. As indicated by field survey data, the running costs of family farms reduce smallholders' benefits by an average 19%. However, if payments for external labour and development expenses are incorporated, these cost factors rise to even more than half of the grower's comparably small revenues (s. Annex 2). Overall, the tea industry appears to pass costs and risks of market integration on to the producers in order to maintain competitiveness in the face of structural disadvantages. Farmers thus do not only encounter considerable disincentives to intensify production also but serious obstacles to improve their wellbeing (FAO 2012).

As pointed out previously smallholders and processing companies usually interact based on contractual arrangements. Such relationships are commonly known as contract farming and defined as "forward agreements specifying the obligations of farmers and buyers as partners in business" (WILL 2013). In a legal sense producers commit themselves to supply a stipulated volume and quality while the processor assures to take-off the good at a more or less predetermined price. Usually, the buyer provides a number of services to support production such as credit schemes, upfront delivery of inputs or trainings to improve farming practices or post-harvest crop management. In this way, farmers overcome hurdles to access high-value markets whereas processors and traders secure their access to resources (s. Tab. 1). Huge variations exist concerning formality, specificity of obligations, modes of payment and duration of the contracts. Among the different types of contract farming outgrower schemes are the most institutionalized. Thereby, growers are located in proximity to a nucleus estate, consisting of a processing facility and an associated large-scale plantation which provides a basic level of raw material. The produce of smallholders is used as a supplement or to top up production. Outgrower schemes are normally characterized by substantial investments on the buyer's side, a high degree of control over the supply chain as well as close monitoring and intensive provision of services (IFAD 2011).

Figure 5:
Value chain for black tea from surveyed areas



Data: FAO 2012, Ezra et al. 2014 and Field Survey 2015

Photo: dpa/picture alliance

Tea outgrowers deliver their daily harvest at the processing plant.

Table 1:
Potential benefits for producers and buyers in under contract farming (after IFAD 2011)

Producer:	Processor/Trader:
• Guaranteed access to new, higher-value markets through processing and export • Improved access to credit, inputs and services • Reduced fixed and variable costs (equipment/ inputs, transport) • Better access to new technical and management skills • Improved access to information and enhanced market transparency • Higher income due to increased yields, direct buyer linkages or quality-related premiums	• Reduced capital investment compared to centralized production • Enhanced control over sourcing (variety, quality, timing, food safety, traceability) • Diversifying production risks via smaller, dispersed production areas • Greater flexibility in responding to market signals and incentives • Favourable public relations with government and the wider public • Enhanced transactional efficiencies and reduced procurement costs

Outgrower schemes are the main principle of grower-buyer arrangements in the Ugandan tea industry. Due to the sector's recent growth, the number of outgrowers in the country increased to 14,000 (MAAIF 2011). With the exception of Mpanga Growers Ltd. where farmers are the legitimate shareholders, all surveyed companies are private enterprises based on a nucleus estate. Most of the farmers own two to five acres of land and rely predominantly on family labour. Whereas additional hired labour is only a major cost factor for few, the conversion of their plots into tea plantations entailed substantial investments for all of them.

The plucking of tea leaf ("two leaves and a bud") can be done all throughout the year with labour peaks during rainy season. On poor soils harvests average 1,000Kg/ acre while they might be duplicated on good soils or by the use of fertilizer. Yet, the observed production systems tend to be rather low input. Moreover, many growers maintain a diversified portfolio including food crops and coffee, despite the factory staff's efforts to encourage further specialization. Transport costs as well as farm inputs are facilitated by the buyers but later deducted from the final payments. Producer prices and interest rates for loans issued by the processors heavily depend on their local competition. Buyers may adjust their prices between two times per year to every second week. Within the last decade annual farm gate payments varied from 110USh to 480USh. Although world market fluctuations did not always trickle down to producers, the findings presented in chapter 5 show that the 2013 price drop seriously affected outgrower production systems and livelihoods (s. Fig. 4/Annex 3).

3 The Debate on rural Development and agricultural Transformation

3.1 International Debate

Since the 2008 food price hike, agriculture and rural development are back on the international agenda. Triggering riots and civil unrest in many low-income countries, the crisis gave cause for concern on how to sustain the growing global population in the future. Although prices for most food commodities temporarily recovered after the peak, it is expected that global population growth, increasing prosperity in emerging economies and rising energy costs will keep them at substantially higher levels as compared to the beginning of the century (WIGGINS AND KEATS 2013). While this indeed poses a challenge for consumers worldwide it may also entail opportunities for small-scale food producers which ironically constitute the majority of the global poor.

As a result, the 2015 Sustainable Development Goals (SDGs) reflect a higher priority for the fight against hunger and a more complex definition of food security (Goal 2) than the earlier Millennium Development Goals (MDGs). Further novelties include the focus on doubling smallholders' productivity and incomes through sustainable food production systems that support resilience to climate change and preserve biodiversity among others (FUNCH 2015). Preceding the SDG adoption, various policy initiatives renewing international commitment to eradicating hunger have been launched, including the New Alliance for Food Security and Nutrition, the Scaling-up Nutrition (SUN) movement and the Comprehensive Africa Agriculture Development Programme (CAADP). The increasing involvement of private sector enterprises therein constitutes another new trend. Development agencies, think tanks and academia published an increasing number of concepts and policy papers, coming to diverging answers on how to facilitate and support agricultural production, food security and the implicitly required structural changes in developing countries' rural areas. Consequently, they also vary in their assessment of available technical and institutional approaches, such as sustainable agriculture and contract farming. In their conceptual study on structural transformation in Sub-Saharan Africa RAUCH ET AL. 2015 identify four general lines of debate (s. Tab. 2):

A) Radical Transformation: This vision of rural transformation refers to the experience of agricultural intensification in the wake of industrialization. Based on the assumption that this historical pathway is generally replicable, its supporters argue in favour of efficient large-scale commercial farms, the exodus of a vast majority of smallholders from rural areas and subsequent urbanization. The preferred production pattern is high-input, specialized and based on labour productivity. Integration of small farms into contract farming arrangements is perceived as the only way for their continued existence (COLLIER AND DERCON 2014).

B) Differentiated or "gentle" Transformation: Acknowledging that smallholders are diverse in their potential for commercial production, different options are proposed for three basic types of farmers. Thereby, those emerging farmers who are capable to intensify production will be successfully integrated into the market economy. Contract farming arrangements are considered an important approach in this regard. At the same time, it is believed that an emerging non-farm sector provides incentives for a second group of farmers to "step out" of peasantry. Third, the marginalized or remote farmers remaining shall be supported in subsistence farming or covered by social welfare. There is no clear preference with regard to the means of agricultural intensification (DORWARD ET AL. 2009, WIGGINS 2016).

C) Inclusive Transformation: As structural transformation historically took place in closed economies, its supporters question its repeatability under globalized conditions. Yet, they are more optimistic about the potential of smallholders whose majority, if supported, could become competitive in both domestic and international markets. Since only a labour intensive farm sector will be able to absorb growing populations and facilitate social inclusion, yield gains should preferably be made by increasing area productivity and reducing production risk. The approach is flexible with regard to technical means of agricultural intensification while the role of large-scale enterprises is seen as rather complementary. Hence, contract-based market integration is a viable solution for selected cases only (LOSCH ET AL. 2012).

D) Stabilization and Autonomy: The increasing dominance of large-scale agribusinesses is perceived as a threat to the existence of smallholders and their livelihoods. In response, their capacities, autonomy and control over resources have to be strengthened. Locally adapted farming systems form the benchmark for agricultural intensification and preference is given to the development of regional market structures over world market integration. Against this background, potential to raise farm productivity and to boost national economic growth may remain untapped. Contractual arrangements that incorporate smallholders into the global economy are suspected to entail external land appropriation (OYA 2012).

While all four positions in the debate acknowledge that external risks as well as market and institutional deficiencies are the limiting factors for smallholder production rather than farm size, they explicitly disagree on a) the capability of small-scale farmers to take advantage of the recently improved market opportunities, b) the replicability of structural transformation as experienced in the Western world and parts of Asia c) their emphasis on either economic growth or social inclusion. With regard to the question how the necessary agricultural intensification should be achieved at farm-level, the flexible options B and C leave room for debate (s. Tab. 2). It is important to stress that in policy practice, these lines of argument can rarely be distinguished as clearly as described above. As the following review of documents issued by German and Ugandan authorities will display, facets of different positions may merge within the national discourses.

3.2 Orientation of German Development Policy

The Federal Ministry for Economic Cooperation and Development (BMZ) declared agriculture and rural development as key priorities of German foreign aid policy with the launch of the 2011 Strategy Paper on Rural Development and Food Security. Therein, smallholders' transition from vulnerable subsistence farming to sustainable commercial production is identified as the main challenge on the way to end poverty and hunger. Furthermore, agricultural growth is perceived as the starting point and the engine for successful economic development. The need to increase self-supply capacities in times of volatile food markets is equally emphasized as is off-farm diversification of rural incomes in order to facilitate structural change (BMZ 2011).

Table 2:
Scenarios for structural transformation (after Rauch et al. 2015)

	Option A	Option B	Option C	Option D
Basic Assumptions	Historical pattern of structural transformation fully replicable	Agricultural growth creates non-farm employment for many	Non-farm sector unable to generate sufficient employment	Replication of western structural transformation not desirable
Role of Smallholders	Mainly inferior and redundant	Majority to exit agriculture, others integrated into global markets	Majority able to intensify and compete in domestic and global markets	Integration into local and regional economies
Preferred farming system	Conventional, industrial agriculture	Conventional or sustainable agriculture	Preference for sustainable agric. if productivity gains possible	Clear preference for sustainable agriculture
Goal Criteria	Economic growth based on increased labour productivity	Economic growth, social inclusion relies on non-farm sector	Social inclusion, economic growth through increased area productivity and reduced risk	Self-sufficiency and autonomy for smallholders

Photo: H. Schwarzbach/MISEREOR

Keeping a milk cow adds to a balanced diet of all family members, to the household income, and provides valuable manure for the soils.

The 2013 Strategy to promote Sustainable Agriculture further specifies the preferred pathway for rural development and its central objectives poverty reduction, food security and resource conservation/climate neutrality. Accordingly, smallholders will be able to benefit from rising food prices if they raise their plots' area productivity through sustainable intensification. While this means to diversify production, use resources more efficiently and minimize ecosystem interference, it does not necessarily imply a shift to environmentally sound farming methods as promoted by MISEREOR and its partners (s. Section 1.2). Suchlike approaches are acknowledged to present viable alternatives only under some conditions. Supporting small-scale farms also entails their modernisation, commercialization and integration into value chains. Producer organisations and contract farming are two options considered. In this way, an efficient smallholder sector is expected to trigger structural transformation in rural areas. Responsibly facilitating and accompanying this process requires the creation of secondary and tertiary employment opportunities as well as social safety nets (BMZ 2013a).

The latter indicates an understanding of rural transformation where by differentiated groups of smallholders should be addressed by separate strategies that enable them to either intensify their agricultural production, enter the rural non-farm economy or access social safety nets. Controlled emigration of rural dwellers to urban areas is perceived as necessary and should be encouraged to ensure the long-term stabilization or increase of farm-sizes (GIZ 2015, SILBERHORN IN REMESCH 2015).

Agriculture and rural development eventually became the primary focal points of BMZ's policy with the launch of the special initiative "One World, No Hunger" (SEWOH) in early 2014. In this way, the German government devoted an additional € 725M to eradicate hunger and malnutrition as well as to support socially and environmentally viable agriculture (BMZ 2015). The programme is currently rolled out in more than ten developing countries; the vast majority of them located in Africa. Its main fields of action comprise:

- Food Security
- Resilience in Crisis and Conflicts
- Innovation in Agriculture and Food Production
- Structural Transformation in rural Areas
- Soil Protection and Rehabilitation
- Land Rights

Although structural transformation is one of SEWOH's key pillars, there is no distinct concept for its management thus far. On the one hand, the approach explicitly denies support for industrial agriculture, pursues the previously outlined broad understanding of sustainable intensification and acknowledges that rural labour surplus is unlikely to be absorbed by an emerging formal secondary or tertiary sector. On the other hand, representatives lack a clear commitment to a socially inclusive and pro-poor oriented development of the rural economy and continue to favour market integration of smallholders over their self-reliance (SCHMITZ 2015, SCHMITZ 2016).

This becomes evident in SEWOH's declared flagship project, the establishment of more than ten "Green Innovation Centres" that aim at modernizing food production along all parts of selected value chains. In doing so, these focal points shall simultaneously increase farm income and support off-farm employment. Since contract farming has been acknowledged as a promising approach to promote inclusive businesses previously to the initiative (BMZ 2013b, GIZ 2013), it is likely to play a key role therein. However, as value chain-based approaches have proven to mainly address the more resourceful among peasants, there is a need to address the marginalized parts of rural populations through complementary pillars, e.g. those concerned with food security and resilience (BUNDESTAG 2015).

Hence, on the basis of fundamental strategic documents, official statements and recently published technical papers, the discourse within German development policy features elements of both, differentiated and inclusive transformation. Despite or because of the still pending considerations, civil society has been criticizing both the BMZ core policies and the SEWOH initiative for missing out on the actual target group and serving the interests of large-scale agribusinesses to

the detriment of the rural poor (HÖRING 2014, WIGGERTHALE 2015).

The BMZ declared Uganda as a priority country of bilateral cooperation in 2007. Although it is not covered by the SEWOH initiative, the German implementing agency GIZ is currently conducting project activities to support climate smart agriculture and livelihood diversification as well as farmers' access to credit and value chain transparency among others (GIZ n. d.).

3.3 Orientation of Ugandan Agricultural Policy

As described in section 2.1 agricultural policy in Uganda can be characterized as uniquely liberal since the Structural Adjustment Programmes (SAPs) of the late 1980s. However, the government not only removed most trade policy interventions but also began to neglect the sector in terms of public expenditure. While official outlays for agriculture increased steadily since the early 1990s, its overall share in the national budget decreased to a meagre one percent by the end of the century (FAN AND ZHANG 2008). Uganda officially renewed its interest in rural development with the commitment to the Comprehensive Africa Agriculture Development Programme (CAADP) in 2010 and the following launch of the Agricultural Sector Development Strategy and Investment Plan (ASDISP) 2010-2015. Yet, it is far from meeting the declared targets[2] as related expenses still account for less than five percent (FAO 2015).

The 2013 National Agriculture Policy reinforces the government's dedication to a market-oriented and private sector-led economy. Its primary objectives to achieve national food security and improved livelihoods shall be accomplished by achieving smallholder transition from subsistence to commercial farming and further reduce hindrances for private investment (MAAIF 2013a). The specific objectives address the following issues:

- Food and Nutrition Security
- Increase rural Incomes
- Promote Specialization
- Market Integration
- Sustainable Resource Management
- Human Resource Development

In practice, boosting productivity and fostering market integration are prioritized as they comprise 90% of the ASDISP's budget. Therein, sub-programmes on extension services, research and development, value addition, pest control and regulatory services have been deemed as the main fields of action. Whereas earlier policies tended to underestimate the smallholder sector (WORLD BANK 2011), the ministry's recent guidelines praise their potential. Accordingly, the key to its realization lies within specializing in a set of strategic commodities that includes staple foods as well as export crops and livestock products. A focused approach will eventually lead to the development of processing value chains and the establishment of agro-industrial centres. Since the outgrower scheme model is one of the primary practical options under consideration to achieve this, the government is seeking to explore further potential for Public-Private Partnerships (PPP) beyond the existing contract farming portfolio (MAAIF 2010a, MAAIF 2013a).

Similar to the German perspective, the underlying assumption of these policies is that raised productivity will enable rural populations to engage in value chain-related non-farm activities and thus, prosperity will rise in the long run. Although it is recognized that those who cannot be integrated into the market economy have to be addressed by investments in staple food crops to ensure food security, the ASDISP does not offer tangible concepts in this regard (MAAIF 2010a). The current policy framework thus cannot provide a sophisticated answer to the diverse and complex realities of smallholders which is indispensable to ensure social inclusiveness. On the contrary, civil society organisations, have accused the investor-friendly approach to have invited cases of "Land Grabbing" resulting in the radical displacement of small-scale farming households (GRAINGER AND GEARY 2011, FALK 2013).

With regard to production systems promoted, the 2013 policy notably highlights the concepts of Conservation Agriculture (CA) and Sustainable Land Management (SLM) as to be disseminated among all farmers. Although both principles include techniques and practices also comprised by MISEREOR's understanding of Sustainable Agriculture (SA) (s. Section 1.2), they do not necessarily imply a strong commitment to environmentally sound farming practices. Under ASDISP a sub-programme of the productivity increase pillar is dedicated to SLM and the Sustainable Land Management Investment

[2] CAADP targets as defined in the 2003 Maputo Declaration: a) strategic commitment to agriculture-led growth, b) 6% annual agricultural growth rate, c) 10% public expenditure on agriculture

Framework 2010-2020 (SIF-SLM) outlines the long-term intentions to conserve and utilize national land resources. However, current expenditures account for just 0.8% of the total agricultural budget (MAAIF 2010a).

Accounting for an average 2 Kg/ha/year, the use of chemical fertilizers in Uganda is one of the lowest in the world. On the one hand, the inherently fertile soils in much of the country were, up until recently, sufficient for most smallholders and their means of production. On the other, poor transport infrastructure led to high fertilizer costs while low market prices for farm output, increasing climatic risks and crop diseases further discouraged investments in chemical inputs (BENSON ET AL. 2013). While usage rates are much higher for neighbouring Tanzania (9 Kg/ha/year) and Kenya (52 Kg/ha/year), these have also subsidized fertilizers up to 50% in the recent past (WORLD BANK 2016). Following the paradigm of minimum market interference, Uganda has seen a permanent absence of such support mechanisms. As recently as 2013, the Draft National Fertilizer Investment Strategy and Investment Plan (NFS), for the first time considers fertilizer grants to resource-poor smallholders to boost average application rates to 50Kg/ha by 2019. Although the scheduled procurement only accounts for 4% of the NFS's US$ 39.6Bn budget, a comparison with the decennial SIF-SLM funds of US$ 245M reveals clear policy priorities in favour of chemical rather than biological inputs (MAAIF 2010b, MAAIF 2013b). However, the latter government orientation seems to lack a broader perspective to increase and conserve soil fertility.

4 Methods

A research team comprising a Ugandan and a German senior consultant as well as eight students of Makerere University, Kampala gathered empirical data during a ten week field visit from June until August 2015. The investigators made use of a variety of quantitative and qualitative methods including in-depth interviews with local experts, methods of Participatory Rural Appraisal (PRA) and a quantitative household survey. With regard to the latter, the study adopted the household concept of *"a group of persons who normally live and eat together"* as defined in the Uganda National Population and Housing Census (UBOS 2014).

Photo: L. Bachmann/MISEREOR

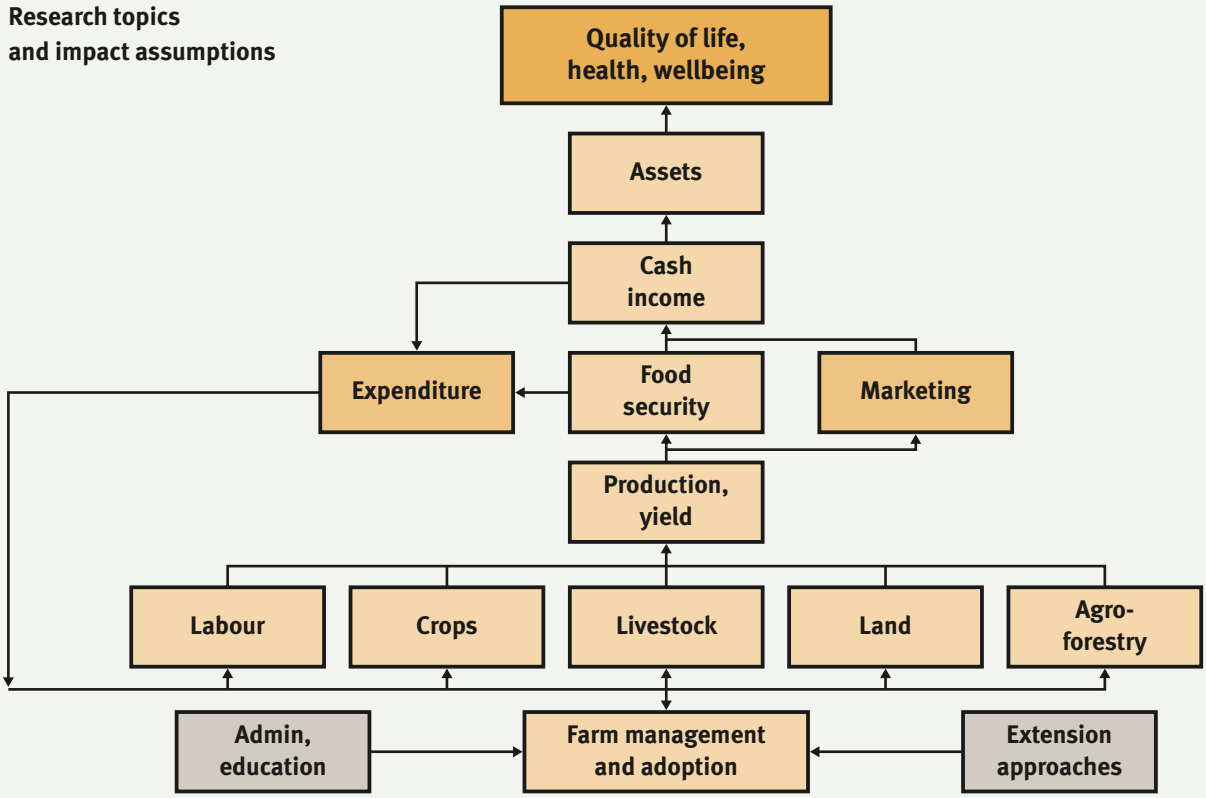
The enumerator explains the calculations of household income to the interviewee.

Focus Group Discussions (FGDs) were held with a total of 176 farmers in six of the ten districts targeted by MISEREOR's partner organisations (s. Annex 4). They mainly included brainstorming and ranking exercises in order to acquire a deeper understanding of how local livelihoods have changed over time, the risks and challenges they encounter today and the farmers' perspectives on recent socio-economic developments. Hence, the topics addressed include market trends, performance of agricultural extension programmes, climate risks and food security, land fragmentation as well as intra-household labour division and migration.

To get an insight into the tea sector four qualitative guideline interviews were conducted with key informants at Mpanga Growers Tea Factory Ltd., Mukwano Commodities Ltd. (both in Kabarole) and a national tea research center. In addition, farm gate prices were obtained from McLeod Russel Ltd. in Hoima District and Tamteco Ltd. in Mityana District. Thereby, the main interest was on the latest developments in the industry as well as the perceived benefits from contract farming arrangements. Trends in tea production were discussed with the Rwebitala Tea Research Institute.

The quantitative household survey is the centrepiece of this study's empirical investigation. It focused on six out of ten districts covered by MISEREOR partners (s. Fig. 1/ Annex 5). Its design was based on the 2005 survey and addressed an extensive range of subjects derived

Figure 6:
Research topics and impact assumptions



from the underlying impact assumptions shown in Fig. 6. After first pre-tests and modifications proposed by partner organisations and MISEREOR headquarters in Aachen the questionnaire addressed farm productivity, food security and wealth indicators as well as the general livelihood context (s. Annex 6). Furthermore, participating SA farmers were asked to assess the quality of MISEREOR-supported programmes and their own performance therein. Thereby, the adoption of technical and social innovations was estimated on a scale from 0 to 4. In practice the interviews took some two to three hours each, also encompassing a short visit to the plots of the respective household.

In order to ensure comparability with the 2005 survey of 700 cases, it was aimed for a similar sample size. Hence, 714 households were interviewed, almost equally representing the three target groups and including 252 SA farmers, 252 members of the reference group and 210 tea farmers. As no outgrower sample could be surveyed in the immediate surroundings of Kampala, a comparative survey sample of tea farmers was selected in Mityana District. SA farmers were randomly selected based on project participant lists.

Reference group representatives were drafted according to an ad hoc procedure whereby the third household from the previously surveyed SA farm was chosen, given it did not receive any other support and owned less than 12 acres[3] of land. Outgrowers were also sampled by principle of chance according to documents provided by local tea factories. The total duration of survey implementation accounted for 30 days.

Data from the questionnaire was entered in a central field office using GrafStat 4.68 and later analysed with SPSS 16.0. In a few cases, the data gathered was converted into indices or proxy indicators to allow comparability. For example, to assess household agricultural workforce, family members' age was translated into labour units (s. Annex 7). All research questions were examined according to descriptive statistics including averages, median, frequencies and percentiles where appropriate. In some cases, multiple linear regression and binary logistic regression models were applied to identify causal relationships between different variables. Previous to applying regression analysis, correlations between explanatory variables were assessed to avoid multicollinearity. With regard to statistical significance, the common error margin was defined at $\alpha = 5\%$.

[3] 1 acre = 0.41ha, it should be noted that some respondents were unable to state the exact size of their farms. In these cases it was attempted to generate approximate values by asking the farmer to compare his or her plot to a football field (roughly 0.45ha).

5 Findings

5.1 Local Risks and Challenges

Survey participants across all three groups ranked their main challenges in a similar way. Lack of capital, climate-related hazards and pests and crop diseases dominate the risk assessments compiled during FGDs (s. Tab. 3). The latter's increased relevance can, for instance, be explained by the worrying spread of banana bacterial wilt *(Xanthomonas campestris pv. Musacearum)* which affects the production of Uganda's staple crop on a nationwide scale. Regarding climate change, elderly farmers expressed that rainy seasons have become less reliable and drought as well as flood events have become more frequent and severe.

Since tea outgrowers primarily rely on cash crop farming rather than subsistence to secure their livelihoods, they are less affected by the banana wilt. Pests and crop diseases are therefore seen as less of problem than for the two other groups. However, risks relating to market integration such as low farm gate price and price fluctuations take a more prominent role in their assessment. Their comparably input intensive farming systems currently suffer from a lack of labour as well as chemical fertilizer. Lack of capital, the most pressing problem in their case, has thus to be interpreted as an interplay of high input and low output prices. Furthermore, extension services were rated poor or non-existent by more than 60% of tea farmers (s. Box 1). This might come as a surprise because secure access to services and inputs are key incentives for smallholders to join outgrower schemes. In times of low world market prices delivery apparently proves to be inconsistent.

The impact of efforts undertaken by MISEREOR's partner organisations becomes apparent when looking specifically at the risk landscape faced by SA farmers. Issues related to agricultural inputs and extension services like demand for seeds, fertilizer and pesticides which held ranks four to eight in the 2005 assessment completely disappeared from the top ten challenges encountered. Obviously, the respective project's service provision was able to accommodate such demands by offering alternatives strategies to conventional high-input farming. Notably, also the problem of soil degradation ranks lower for SA farmers than for the other two groups. Public or private extension services on the other hand, neither proved to have a substantial presence nor impact in most locations (s. Box 1). The following section provides a more detailed analysis of farmers' endowment with the two basic factors of production, land and labour.

Table 3
Top ten challenges identified by farmers

Rank	Reference Group	SA (2005 Ranks)	Outgrowers
1	Drought	Pests and diseases (8)	Lack of capital
2	Pests and diseases	Drought (2)	Lack of labour
3	Lack of capital	Lack of capital (3)	Drought
4	Lack of land	Climate change (-)	Pests and diseases
5	Poor soil fertility	Lack of labour (8)	Low farm gate prices
6	Lack of labour	Lack of land (9)	Lack of chemical fertilizer
7	Climate change	Lack of market (1)	Poor soil fertility
8	Lack of market	Poor soil fertility (14)	Lack of market
9	Lack of seeds	Theft (-)	Price fluctuation
10	Low farm gate prices	Price fluctuation (12)	Lack of land

Box 1

Provision of agricultural advisory services

Agricultural extension or advisory services are meant to support farmers by conducting research and development, facilitating the scaling-up of successful innovations, providing educational, technical and financial services as well as empowering them to protect their own interests through farmer organizations. In an attempt to increase quality and efficiency of rural service delivery, the Ugandan government transformed its public extension system into an innovative public-private partnership agency in 2001. Under the National Agricultural Advisory Services (NAADS) programme farmers demand for services is served by independent agents employed on a short-term contract basis. Despite improved general service availability, its failure to deliver appropriate solutions to resource-poor smallholders led to rather disappointing outcomes and resulted in the agency's temporary suspension in 2007 (BENIN ET AL. 2007, BETZ 2009).

The NAAD's limited success was also confirmed by smallholders during the field survey. Only in two of six locations public extension services were perceived as improved and more than half of all respondents rated them poor or non-existent. Instead both, reference group and tea farmers mostly use radio programmes to access agricultural information. This is particularly surprising as one would expect intensive service provision by private sector stakeholders in Outgrower schemes (s. Section 2.3). Apparently, extension capacities were reduced significantly following the 2014 tea price drop. SA farmers on the other hand expressed generally high degrees of satisfaction. Yet, there is room for improvement for MISEREOR's partners in terms of equity and consistency of delivery.

Service Provider	Reference %	SA %	Outgrowers %
MISEREOR Partner	n.a.	98.0	n.a.
Government (NAADS)	41.3	45.6	23.8
Media	60.3	20.6	58.1
Private Sector	5.2	1.2	21.9
Other NGOs	11.5	14.7	21.4

Level of smallholder satisfaction with extension providers (Best or second best option)

5.2 Factors of Production

As shown in Tab. 3, insufficient access to basic productive assets like land and labour is an issue that has gained urgency within the last decade. Data gathered during the two field surveys in 2005 and 2015 indicate an overall 38% decline of land cultivated (s. Tab. 4). Thereby, the reference group lost more than half of its land while project participants were able to maintain 82% at least. Today, they own twice as much as their counterparts. This may be ascribed to the fact that SA farmers are slightly older and thus tend to own bigger plots in the first place. Besides, they were also more able to acquire new land.

Since reference data is not available for outgrowers the analysis is restricted to the 2015 data. Accordingly, tea farmers own acreages comparable to those of SA farmers. Although they face similar basic conditions land shortage did not rank among their most pressing problems (s. Tab. 3). This can be explained by the labour-intensive nature of tea harvesting which obviously does not leave much capacity for farm activities beyond the main cash crop. Outgrowers' envisioned solutions for the lack of capital identified as the number one challenge thus focus on increased use of fertilizer or better farm gate prices rather than spatial expansion of tea plantations.

To explain the shrinking farm sizes smallholders identified population growth as the main responsible driver during FGDs. As a general rule, farmers subdivide

Table 4
Land ownership and utilization

land size in acres 2015 (2005)*	Reference Group 2015 (2005)	SA 2015 (2005)	Outgrowers 2015
Owned	2.5 (4.9)	4.9 (6.0)	4.7
Owned by male/female headed HH	2.8/2.1	4.5/3.5	5.3/2.6
Land bought (last 10 years)	0.2 (0.2)	0.4 (0.3)	0.2
Land rented (last 10 years)	0.2 (0.0)	0.2 (0.0)	0.1
Land borrowed (last 10 years)	0.1 (0.3)	0.1 (0.4)	0.0
Share of cultivated	88% (63%)	74%** (65%)	83%
Share of grazing land	4% (12%)	12% (13%)	6%
Share of fallow and woodlots	8% (25%)	14% (22%)	11%

* 5% trimmed means

** UAV test: Diff. SA/R= 0.000 Difference very highly significant; SA/OG = 0.069 Difference

their land among their sons when these get married at the age of 18 to 22. When elders' ability to work declines at the age of 50 to 60 years their descendants usually receive another portion. Formal ownership however, remains with the elderly household head until death. In previous generations, young families used to acquire additional land in the near proximity of their parents' homestead. As this becomes increasingly difficult people are forced to use their plots more intensively and over longer periods of time. Hence, the share of cultivated land increased sharply across both groups while especially fallow areas and woodlots got diminished (s. Tab. 4). Continuous cropping without adequate soil fertility management leads to nutrient mining and deterioration of soil structure. These signs of land degradation make themselves known through reduced water holding capacity, decreasing soil fertility, growing vulnerability to erosion and finally declining yields. At the same time, holdings become more fragmented and costs for rent and purchase of land rise drastically. Unlike ten years ago borrowing arrangements were almost non-existent in 2015 and seemed to be replaced by a small but emerging rental market. In addition, more specific problems like excessive plantings of eucalyptus, erosion on steep slopes and conflicts triggered by the return of absentee landlords occur in some locations. Again, these general trends have been less pronounced for SA farmers.

On the other hand, land fragmentation is not considered a serious issue at all study sites. While land shortage is most felt in Kabale where smallholders across all groups own as little as 2.4 acres the situation appears to be far less alarming in Hoima where farmers hold an average 6.4 acres. Similarly, strategies on how to cope with land shortages show considerable variations. While the young rural population is bound to compete in the emerging land markets or migrate to urban areas, residents of peri-urban Kampala may opt for small-scale businesses or lucrative poultry rearing. Investing into livestock is also a popular strategy pursued by the rural elderly. Apart from regional and inter-generational differences, major disparities exist between genders. As depicted in Tab. 4, female-headed households possess only one-third of what male-headed households have at their disposal. In the case of tea outgrowers this discrepancy even increases to 50%.

Considering the impact of population growth on land availability, the fact that farmers name lack of labour as another key challenge may seem contradictory. Indeed, the occurring demand is a matter of affordability rather than sheer availability. The households surveyed can be characterized as typical family farms. Mean sizes vary between 7.4 members for SA farmers, 6.2 members for tea outgrowers and 5.8 members for the reference group. Thus, they all surpass the national average of 4.7 as indicated by UBOS 2014.

Besides family labour, farmers hire external workforce if possible. However, wage labour currently amounting for 80USh/day is unaffordable for many. Only 50% of outgrowers and SA farmers hire casual labourers for about a month per year. In the reference group, merely 25% are able to do so (s. Annex 8). Permanent support by an employed farm worker can be solely afforded by the better off. Notably, this applies

Table 5
Household capacities and labour investment

	Reference	SA	Outgrowers
HH Head's age	41	49	52
HH size	5.8	7.4	6.2
Total domestic labour units*	3.3	4.2	3.4
Domestic labour units engaged in agriculture	1.8 (54%)	2.4 (56%)	1.8 (53%)
Domestic agricultural labour (days / year)	388	518	396
Hired agricultural labour, seasonal (days / year)	33	83	76
Hired agricultural labour, permanent (days / year)	45	218	116
Total agricultural labour (days/year/farm)	466	818**	589
Total agricultural labour (days/year/acre cropland)	283	307	236

* Labour units are an equivalent to working ability of age categories, s. Annex 7

** UAV test: Diff. SA/R= 0.000 Difference very highly significant; SA/OG = 0.027 Difference significant

to 25% of SA farmers compared to just 10% in the reference group and among outgrowers. Labour sharing as it was common in many East African communities during pre-colonial times is rarely practiced today.

The demand for additional workforce is particularly high among tea farmers due to the labour-intensive harvest procedure. Nonetheless, outgrowers currently employ only little more external manpower than the reference group and due to the size of their landholdings they end up with the lowest labour investment per acre (s. Tab. 5). What seems to be surprising at a first glance indicates that extra workforce is available but low output prices prevent out-growers from utilizing it. Evidently, this also holds true for family labour investment among all three groups who, despite a proclaimed lack of workforce, use only half of their domestic capacities in agricultural activities which indicates that off-farm income opportunities might be more attractive (s. Section 5.6).

It should also be mentioned that the previously described trends have led to increasing out-migration of rural youths which in turn creates a de facto shortage of labour availability in some places. FGD participants in all locations estimated an exodus of 50 to 70%, except for Hoima where land fragmentation is not yet as advanced and land holdings are still quite large. Accordingly, male rural-urban labour migration is mostly temporary whereas women only leave home when getting married or – in the case of peri-urban Kampala – to access education.

The comparison of labour input per acre also reveals another interesting finding. Although SA farmers tend to have bigger households and thus, theoretically more capacities at their disposal their actual efforts are not that much different from the reference group. Obviously, employing the practices of sustainable agriculture promoted by MISEREOR partners may be laborious in the early stages but running costs are similar to those of conventional local farming systems. Thus, the next section examines the impact of their extension efforts on local production systems and farm output.

While cities continue to expand, the rural population grows strongly as well. Practiced inheritance arrangements lead to increased land fragmentation.

5.3 Production Systems

The wide range of species and varieties found within nature form the basis of agricultural production systems. Smallholder cultivation all across the world has developed a broad assortment of local crop breeds. Conserving and enhancing this diversity strengthens resilience towards pests and diseases as well as climate change and enables farmers to react flexibly on market incentives. Mutual benefits between crops can increase yields and maintain soil fertility. Not least, diverse farms contribute to general biodiversity and environmental preservation.

On the average, SA farmers cultivate 23 crops compared to 15 in the reference group and 18 among tea outgrowers. These differences proved to be highly significant and thus, one can assume that crop diversity is generally some 50% higher on farms engaged in sustainable agriculture. The main food crops include maize, beans and bananas which are grown by more than 90% of all smallholders and can take up between 0.4 and 1 acre (s. Annex 9/ Annex 10). While these staple crops can be found almost equally among all three farmer groups, project participants are much more likely to grow vegetables including species indigenous to Uganda (s. Annex 9). However, biodiversity in terms of different varieties is rather limited on all surveyed plots. Most smallholders grow only one single breed per crop, except for bananas of which the average grower cultivates three types. Coffee is the main cash crop for 72% of SA farmers, 52% of the reference group and even 58% of all tea outgrowers retain some coffee at least. Assuming that 400 trees can be placed on one acre, they keep an average 0.9, 0.7 and 0.6 acres respectively. Although tea is the main focus of this comparative study, the coffee sector is briefly covered in Box 4.

Besides coffee, most smallholders grow a number of fruit trees with the most common varieties being avocado, mango, jack fruit, pawpaw and guava which can be found on almost every farm. Citrus fruits are cultivated to a lesser extent. Despite their apparent prevalence single specimen are usually grown sparsely and bigger plantations rarely occur. Trees with benefits other than fruits, e. g. nitrogen fixation or fodder for livestock, have been promoted as part of the partner organisations' agroforestry programmes. Ficus spec., Calliandra, Leucaena and Moringa are among the most popular today. Furthermore, Eucalyptus spec. has gained popularity because of its fast growth and value on the timber market. Grasses and legumes also provide forage, maintain soil fertility and reduce run-off velocity. Thus, they are often used to complement and secure physical soil conservation structures like terraces.

All trees and fodder plant species are more likely to be found on SA farms rather than along the fields of the other two groups (s. Tab. 6). This is especially true for agroforestry trees. *Calliandra* for instance, is eight times more prevalent than on the other groups' plots. The like is true for minor fruit trees, fodder grasses and legumes. Yet, napier grass *(Pennisetum purpureum)* is the only one among the latter to achieve comprehensive adoption. All species comprised in the indices displayed in Tab. 6 have been taken up at highly notable rates since the baseline in 1995. The constantly higher diversity of SA farms provides further evidence of the remarkable impact of MISEREOR's partners.

Table 6
Performance of agrobiodiversity indicators*

	Ref. Group 2015	SA 2015	Outgrowers 2015	2005-2015 (%)	
				R	SA
Ø no. cattle	0,5	1,4**	1,1	-58	-53
Ø no. goats	1,0	2,4***	2,0	-47	-37
HHs growing fruit trees (%)	52	64	53	-4	-7
HHs growing agroforestry trees (%)	14	31	6	-39	-36
HHs growing fodder grass (%)	9	30	16	-48	-31
HHs growing legumes (%)	1	6	2	-77	-81

* for design of indicators s. Annex 11

** UAV test: Diff. SA/R= 0.002 Difference highly significant

*** UAV test: Diff. SA/R= 0.018 Difference significant

Table 7
Household capacities and labour investment

	Adoption Categories (Self Assessment %)					Mean
	0	1	2	3	4	
Improved Cattle Husbandry						
Housing	38.2	2.0	9.8	11.8	27.5	1.7
Proper feeding	8.8	3.9	14.7	30.4	38.2	2.8
Watering	8.8	1.0	8.8	13.7	62.7	3.1
Health care	8.8	2.0	10.8	26.5	48.0	3.0
Improved Crop Husbandry						
Agroforestry	3.6	12.7	24.6	26.6	30.6	2.6
Compost	14.3	7.5	13.9	20.2	44.0	2.7
Liquid manure	18.7	13.9	16.7	21.4	26.2	2.2
Soil conservation	4.0	2.4	8.7	32.1	51.2	3.2
Mulching	8.7	8.3	14.7	32.9	33.7	2.7
Pest control (banana)	5.2	6.0	16.7	30.6	38.5	2.9

However, when comparing field survey data from 2005 and 2015 one has to acknowledge a general downward trend in all categories. While fruit trees only decreased insignificantly, all species with secondary benefits showed alarming rates of decline. To give a particularly deplorable example, the presence of *Moringa* has declined by 50% on SA farms and 75% on reference farms. Most likely, the advancing fragmentation of smallholder property has made it gradually more difficult to incorporate the full range of crops, trees and plants that do not offer immediate profits. However, further investigation on other possible reasons for the abandonment of certain species is required.

Similar tendencies are observable for the number of cattle and goats which are used here as proxies for general livestock possession (s. Tab. 6). The means show that SA farmer own more than twice as many animals than their counterparts in the reference group. This also holds true in the case of poultry which proved to be especially profitable on the fringes of Kampala. The extension approach to promote livestock rearing as an integrated part of smallholder farming can thus be rated very successful. Nonetheless, the comparison with 2005 data reveals serious rates of decline caused by land fragmentation and decreasing pasture availability. Future programmes need to focus on possible solutions like zero-grazing, dairy farming and more productive forage crops with regard to pasture and agroforestry. Beyond the established pathways of animal husbandry alternative options such as grasshoppers or other insects which have more efficient feed conversion rates and offer a rich source of protein could be explored.

While these developments certainly give cause for concern, a closer look reveals another promising finding. Apart from fruit trees and legumes where differences are marginal, agrobiodiversity has declined to a lesser extent on SA farms as compared to the reference plots. As previously mentioned the range of food crop species even remained stable. Apparently, SA farming systems, albeit not able to fully stop negative socio-economic trends, manage to decelerate the process of declining biodiversity.

Agricultural advisory provided by MISEREOR's partner organisations not only aims to mitigate detrimental trends and preserve the current state of smallholder livelihoods but also to enhance their overall wellbeing. In order to achieve this, trainings have been conducted on a wide range of technical and farm management related topics that enable farmers to stabilize and increase productivity in a sustainable manner. Levels of attendance for such trainings can be seen as generally high since more than 95% of SA farmers interviewed for this study participated. To assess the quality of the respective programmes farmers were asked to rank their own stage in adopting the learned contents on scale from zero to four representing full adoption.

Considering the framework conditions outlined above, the results can be seen as satisfactory to very satisfactory (s Tab. 7). Improved livestock husbandry in terms of

general care and health showed high levels of adoption not only for cattle but for pigs, goats and poultry as well. Among the crop husbandry innovations, soil conservation structures and organic pest control measures addressing the banana wilt disease were most likely to be incorporated into the existing farming systems. Then again, indicators representing livestock integration, such as shelter for zero-grazing or application of liquid manure, seem to lag behind. Apparently many households are unable to bear the associated investments. While the adoption of physical soil conservation measures shows high adoption levels, the practice of composting and mulching is taken up less. Due to the rising numbers of biomass consumers – human and animal – the amount of organic matter returned to the soil tends to decrease steadily. Against this backdrop the promotion of legumes and other green manures becomes even more important. Finally, another technique that has not yet received full recognition from SA farmers is crop rotation. Thus far, it is mainly viewed as a measure to suppress weeds while its potential for pest control is often overlooked. These results illustrate that there is still scope for improvement in extension messages.

The programmes carried out by MISEREOR's partners do not prescribe organic farming but certainly encourage environmentally sound intensification of agriculture. This is in line with the conventional practice in most of Uganda which still can be described as organic by default. Yet, these practices are changing as the share of all farmers refraining from pesticides dropped from 95% in 2005 to 79% in the recent assessment. Surprisingly, the field survey's results show that the use of all chemical farm inputs has especially increased among SA farmers and in the case of pesticides and herbicides even exceeds the application levels of the reference group (s. Tab. 8). First, this implies that pest management solutions for banana wilt offered by partner organisations may not be considered sufficient. Second, the vulnerability of coffee plants towards a number of plant-specific diseases can require a comparably intensive application of pesticides. According to binary logistic regression coffee farmers are over four times more likely to use pesticides than non-coffee farmers (s.

Table 8
Application of chemical farm inputs

	Reference	SA	Outgrower
Percentage of farmers using pesticides			
2015	6.0%	21.0%	3.8%
2005	22.9%	5.0%	n. d.
Percentage of farmers using herbicides			
2015	22.6%	29.0%	29.0%
2005	13.5%	16.2%	n. d.
Percentage of farmers using chemical fertilizer			
2015	21.4%	18.7%	59.5%
2005	14.7%	4.2%	n. d.
Number of farmers applying fertilizer (NPK)			
1-25Kg/acre/year	26	19	67
26-50Kg/acre/year	6	5	37
51-100Kg/acre/year	2	1	9
› 100Kg/acre/year	0	0	3
Average fertilizer application (NPK)			
Mean Kg/acre/year	2.7	1.7	19.2
Mean Kg/ha/year	6.8	4,3	48

Photo: L. Bachmann/MISEREOR

Good mulching practice and healthy matoke plants

Annex 12). During FGDs, the rising herbicide application across all groups was interpreted as a strategy to cope with the general shortage of labour.

Although average values for national fertilizer consumption as specified in section 3.3 are significantly surpassed by all groups, the use of chemical fertilizer is still moderate. The differences between tea growers and the other two groups can be explained by the varying requirements of their main cash crops. Fertilizer recommendations are usually higher for tea than for coffee and outgrowers have better access to it through their buyers. Taking into account the currently insufficient service provision by most tea factories FGD participants stated that normal application rates are three to four times higher.

In summary, SA farming systems tend to be more diverse and intensified than conventional as well as outgrower approaches. Comprehensive and context-sensitive service provision by MISEREOR partners enabled project participants to withstand negative external trends. Yet, there is a continued need for locally adaptable agricultural innovations, especially in the fields of pest management, livestock and labour saving technologies. To ensure successful scaling-up and dissemination at a later stage, these should be developed in close cooperation with the local communities.

5.4 Farm Output

To assess the changes in farm productivity over the last decade the field survey relied on smallholder estimates of their most recent harvest and the 2005 crop. Banana as the main staple food and a second crop to be selected by the farmers served as indicators for overall yield development. In spite of shortcomings in cases where respondents did not know the exact size of their land, yields were not measured accurately or shorter time periods had to be chosen, farmers generally have a quite realistic idea of their harvest and respective changes.

Due to the pervasive banana wilt both SA farmers and the reference group faced alarming decline rates of 13% and 33% respectively (s. Tab. 9). While SA farmers still had a strong yield advantage in 2005 (43%) it declined to 11% in 2015. A comparison based on median values for 2015 reveals that project participants produce 19% and 33% more bananas than the reference group and outgrowers respectively. Thereby, manure, soil conservation and better crop husbandry were identified as the most valuable extension tools by the farmers themselves. Despite the previously identified tendency of pesticide use among SA farmers, organic pest management for bananas trees is strongly associated with higher yields as well. Besides pests and diseases, the main cause for yield losses among SA farmers and the reference group were declining soil and shrinking land sizes. Highly notable, statistical analysis

Table 9
Banana yield development

	Reference	SA	Outgrower
Means kg/acre 2005[1)]	3326	4755	n. d.
Means kg/acre 2015	2875	3178	2758
Median kg/acre 2015	2222	2640*	1760
Relative difference %	100	119	79

1) Bachmann 2005 data ,* UAV test: Diff. SA/R= 0.018 Difference significant; SA/OG = 0.006 Difference highly significant

also shows a negative influence of fertilizer and composting (s. Annex 13/Annex 14). The latter finding in particular requires further investigation. Tea outgrowers on the other hand, tend to ascribe successes as well as failures to application or the shortage of chemical inputs.

A closer look at the percentiles reveals two other important findings (s. Tab. 10). First, the major losses between 2005 and 2015 are mainly reflected in the upper sections of both groups. This suggests that highly productive farms with initially good yields were hit harder by the overall decline than the less productive ones. Second, current harvests and the 2005 data consistently shows that SA farmers in the lower percentiles show increases

Table 10
Stratification of banana yields

Harvest	Group	10P	25P	50P	75P	90P
2005[1)] Median (Kg/acre)	Reference	440	1320	2640	5390	7047
	SA	913	1891	4180	7700	9768
2015 Median (Kg/acre)	Reference	449	981	2222	3710	7036
	SA	822	1488	2640	4224	6124
	Outgrower	155	550	1760	3024	9900

[1)] Bachmann 2005 data

of 50 to 100% compared to reference group, while the yield advantages in the upper percentiles is a little less pronounced. Apparently, the impact of SA extension work is most visible on the less productive farms. Since low farm output often is a result of meagre resource endowment one can conclude that sustainable agriculture as understood by MISEREOR and its partners particularly benefits the poor parts of the rural population.

Acknowledging the seriousness of the banana wilt disease, extension programmes will have to continue refining the existing approaches. Continued promotion of a diverse range of banana varieties is a first step to reduce the risk of infection. However, as the more robust types developed by conventional agricultural research require high amounts of fertilizer, there is an urgent need for farmer-led breeding programmes focused

Box 2
Marketing and processing

The topics of marketing and processing are usually introduced in the second programme cycle and almost all interviewed farmers stated to have been trained on post-harvest management and group marketing strategies. Yet, marketing rates remain unchanged compared to the 2005 assessment. As displayed below significant differences across farmer groups and genders occur. Most notably, men are more likely to engage in joint marketing if assigned to a tea outgrower scheme, while women appear to be more adequately addressed under the SA service system. Overall, the likelihood of commercial production in general and female participation in particular tends to increase when farm productivity is high enough to satisfy household's basic food security needs.

Among those SA farmers who do engage in joint marketing activities the level of satisfaction was predominantly high. This shouldn't come as a surprise since sales of surpluses improve their incomes by an average of 74%. For tea growers this gain is even twice as high. However, because of the currently low tea prices, half of the interviewed out-

	Reference	SA	Outgrower
Male %	1.9	36.3	47.7
Female %	4.8	32.9	17.5

Share of farmers engaged in marketing groups

growers considered their commercial success to be only moderate.

Thus far, project efforts have only succeeded to involve farmers in value adding activities on very few occasions. Even close to the urban markets of Kampala processing endeavours remain at less than 2%. This can be explained by the fact that existing initiatives primarily target niche markets and lack broader market information, poor rural infrastructure inhibits product placement and both, quantity as well as quality of participant's produce still have considerable potential for improvement. Taking the last decade's overall promising development of national food markets into account (s. Section 2.1), MISEREOR's partners should intensify their activities in this regard.

on resilient and frugal varieties. Another option is to encourage farmers to reduce reliance on bananas and experiment with alternative staple crops like cassava, sweet and Irish potato as well as millets.

Unlike the case of bananas, yield data for the freely chosen second crop does not provide a clear picture. Differences between the three groups occur regarding various crops but these tend to be moderate and small sample sizes limit the scope for interpretation. Although yield advantages for SA farmers were registered for sweet potatoes, cassava and coffee the overall results are less pronounced than in the 2005 survey. Subsequently, the general irregularity of surplus production continues to inhibit the establishment of enduring processing and marketing structures (s. Box 2).

Summarizing, SA extension programmes again seem to successfully mitigate harmful external impacts. 22% of project participants indicated better yields than ten years ago as compared to 9 to 11% in the two other groups overall. However, keeping in mind that 2005 has to be considered a drought year, these figures must be taken with a grain of salt.

5.5 Food Security

Food security comprises the constant availability and secure access to sufficient quantities of safe and nutritious food as well as its adequate utilization with regard to water, hygiene and health concerns. In order to ensure the full development of individual physical and mental capacities the requirements of the four food security pillars availability, access, quality and stability have to be met. The field survey results show that more than 80% of SA farmers had access to ample amounts of food all throughout the previous three years which applies to just 60% of outgrowers and 54% of the reference sample (s. Tab. 11). On the contrary, about one fourth of farmers in the latter two groups suffer from a substantial shortage for two to three months annually. A "hunger gap" of four months or more was only experienced by less than 6% of reference farmers and some 3% of outgrowers and project participants respectively. In general, the situation has improved substantially compared to 2005 where SA farmers and the reference group in that order faced an average 1.7 and 3.1 food insecure months per year. Yet, one has to keep in mind that Uganda experienced an extensive dry period ten years ago.

The potential drivers of food security considered in Tab. 12 clearly display the benefits of diverse and integrated farming systems. Crop diversity is the most important factor to reduce the number of months without sufficient food supply per year and a direct effect of MISEREOR partners' extension efforts. Its benefits lie within risk reduction for the whole production and the immediate availability of comestibles from the own farm. This is followed by the educational level of the head of household whose impact can be explained in terms of better farm management and easier access to profitable off-farm income sources resulting in higher purchasing power. Both impacts are statistically very highly significant and dominate all other variables considered including land ownership, fertilizer application and membership in marketing groups. Livestock being the third important driver has direct merits such as milk and meat as well as indirect effects, e. g. in terms of manure for crop production.

Photo: H. Schwarzbach/MISEREOR

Sustainable agriculture is an effective means to increase food security and nutrition especially for the most vulnerable members of rural society: the children.

Table 11
Food shortages in the last three years

No. of months	Reference (%)	SA (%)	Outgrower (%)
0	53.5	80.8	59.9
1	12.8	8.1	13.3
2-3	28.1	8.7	24.1
4-5	4.2	1.3	1.7
6	1.4	1.1	0.9

As hunger is not only a temporal phenomenon as a result of insufficient intake of calories but can

Table 12
Socio-economic factors' impact on food insecure months per year

	Beta Coefficient	t	Sig.
Number of crops	-.248	6.092	.000
Education of head of HH	-.204	-5.721	.000
Number of livestock	-.086	-2.242	.025
Size of land owned	-.071	-1.759	.079
Membership in marketing group	-.061	-1.601	.110
Fertilizer application	-.060	-1.653	.099
Age of head of HH	-.031	-.834	.405
Pesticide application	-.022	-.615	.539
Sex of head of HH	.015	.411	.681
Agricultural labour units	.059	1.621	.105

Adjusted R^2: .184; model Sig.: .000

occur in form of a constant lack of essential nutrients ("hidden hunger") attention has to be paid not only to the quantity but also to the quality of food. A more differentiated under-standing of food security encompasses nutrient balances, hygiene and health-related issues. A closer look at the changes in smallholder consumption patterns reveals differing trends for each of the farmer groups. More than 80% of SA farmers eat more vegetables, fruits and root crops than before the start of project implementation. Reference values for the two other groups have also been increasing but the percentages are 20-40% lower for most items (s. Tab. 13). These figures reflect a continuously positive trend since 1995. For more expensive and protein-rich animal products however, the reference group could not maintain growing intake as half of its respondents had to cut their respective consumption. Most notably, 50% of SA farmers were able to access more meat, milk and eggs than five to ten years ago.

The overall results suggest that MISEREOR's partners achieved remarkable progress in enabling smallholder farmers to exercise their right to food. As outlined in

Table 13
Changes in smallholder diets

Products	eat more than in 2005 (%)			eat less than in 2005(%)		
	Reference	SA	Outgrower	Reference	SA	Outgrower
Bananas	21.4	60.7	19.0	55.2	28.2	51.0
Cereals	55.6	76.2	62.9	26.6	17.5	22.9
Beans & groundnuts	21.4	60.7	19.0	26.2	14.3	25.2
Root crops	67.9	83.7	62.4	14.7	6.0	16.7
Vegetables	37.3	87.7	25.7	28.6	4.8	35.7
Fruits	47.2	83.7	51.4	20.6	4.8	21.0
Eggs	16.3	51.2	15.7	48.8	23.8	52.9
Dairy products	16.7	49.6	22.9	56.7	28.2	58.1
Meat	16.7	46.4	16.7	48.8	21.0	51.9

Box 3

Empowerment and social change

Improving farm management is a central element of the programmes employed. Besides technical training on better crop and livestock husbandry this also includes farm planning and record keeping. Overall, the qualitative level of adoption was fairly good although cognitive fields of learning, such as individual record keeping, appear to lack behind compared to practical skill instructions. Aside from that, the generally satisfying results were consistent over the last 20 years.

On the group level results showed even higher rates of success with regard to leadership and financial management. Apparently, group performance improved significantly to 2005 where mean adoption ratings ranked a full unit less. The introduction of the Participatory Impact and Monitoring (PIM) systems that enable farmers to identify their own goals and follow up on group achievements most likely contributed to that. SA farmers also received trainings on how to articulate and protect their interests. Some participants stated they got more involved in local politics thereafter.

Significant accomplishments were also achieved in the fields of health, hygiene and gender. Given that these trainings touch upon private and sensitive matters the ratings appear to be extremely positive. Findings from the conducted FGDs however, appear to confirm the suggested results. Almost all farmers assessed their situation better in terms of health, status within the community and general quality of life than at the start of the programmes. Negative trends were only reported concerning environmental pollution which to a certain extent is beyond the scope of the projects implemented.

	Adoption Categories (Self-Assessment) (%)							
	n. a.	0	1	2	3	4	Mean 2015	Mean 2005
Farm planning	5.6	4.8	7.1	22.2	35.7	25.4	2.6	2.7
Record keeping	2.8	19.4	9.5	18.7	33.3	16.7	2.1	2.3
Group leadership	5.2	2.8	2.4	17.1	30.6	42.1	3.0	2.2
Managing group loans	2.0	1.2	0.8	13.1	37.7	45.2	3.2	1.8
Hygiene practises	0.4	0.8	0.8	10.3	37.3	50.4	3.3	n. d.
Gender relations	2.4	0.8	2.4	15.1	39.7	39.7	3.1	n. d
Joint decision making	1.6	0.4	1.6	14.3	33.3	48.8	3.3	n. d.
HIV/AIDS	0.5	0.4	0.0	4.4	13.5	74.2	3.5	n. d.

Adoption Levels of selected Topics covered in Partners' Programme Work

the previous section, productivity and availability of the main staple crop have been stabilized and even increased under the impact of widespread crop diseases. Equally important, diets have become more diverse and nutritious. As displayed in Box 3, partner organisations succeeded in addressing relevant framework conditions in the fields of hygiene and health as well as domestic and community issues. The following and final section of the empirical analysis will address changes in the accessibility of food by evaluating the impact of project interventions on income, savings and expenditure.

However, climatic risks, lack of marketing opportunities and high input costs remain serious threats to food security across all groups. It is therefore crucial for MISEREOR partners to intensify efforts supporting collective marketing and promote water harvesting technologies. In some locations a high demand for water tanks and micro-irrigation has been articulated during FDGs. Poor quality seeds, land shortage and market fluctuations were further identified as secondary risks. Additional improvements could be made in the field of post-natal health and nutrition.

5.6 Income and Expenditure

The positive trends in food security also have implications for income generation. Aliments that are grown on the own plot substitute purchased foodstuff and thus, the equivalent resources can be saved or reinvested. Despite its obvious contribution to the total revenues of smallholder households, the monetary value of home consumption is often overlooked. In the case of the present study, the median value of all crops grown by SA farming families for self-sufficiency is almost twice that of the reference group and even increasing in the lower percentiles (s. Tab. 14). Tea outgrowers, albeit on a much smaller level, enjoy significant advantages as well. The fact that these are highest at the tenth as well as the ninetieth percentile suggests two diversification strategies of tea farmers, based on either necessity or opportunity. Among all food crops, consumption values for bananas are highest and while SA farmers outnumber the reference group by 10 to 50% for almost every crop, disparities reach up to over 100% in the case of the main staple food. Eventually, project participants' intake values also exceed those of tea outgrowers for 75% of all crops considered.

Table 14
Stratification and comparison of gross incomes

Group	25P	50P	75P
Home Consumption Value			
SA/R	+106%	+88% [a)]	+84%
OG/R	+32%	+23% [a)]	+18%
Farm income			
SA/R	+151%	+121% [b)]	+83%
OG/R	+82%	+101% [b)]	+41%
Off-farm income			
SA/R	+60%	+55% [c)]	+71%
OG/R	-24%	-9% [c)]	-9%
Total gross income			
SA/R	+66%	+84% [d)]	+103%
OG/R	+14%	+18% [d)]	+32%

a) UAV test: Diff. SA/R= 0.000; SA/OG = 0.000 Both differences very highly significant
b) UAV test: Diff. SA/R= 0.000; Differences very highly sign.; SA/OG = 0.032 Difference sign.
c) UAV test: Diff. SA/R= 0.000; SA/OG = 0.000 Both differences very highly significant
d) UAV test: Diff. SA/R= 0.000; SA/OG = 0.000 Both differences very highly significant

While the monetary value of home consumption is not immediately felt in terms of cash, the revenue of commercial production certainly is. Median gross incomes of SA farmers and tea outgrowers account for 121% and 101% of the reference group respectively. Again, benefits from sustainable agriculture are much more evident in the lower percentiles where they can amount over 400%. Even when compared to outgrower incomes, project participants enjoy a twofold advantage below and above the median level (s. Tab 14). The favourable 2013/2014 coffee prices cannot fully explain the good results as the increase was too small to be solely responsible for the occurring developments at the farm gate (s. Box 4). In fact, coffee merely constitutes 10% of the total farm income across all groups. Instead, the main contributors for SA and reference farmers were livestock products (24-27%), bananas (18%) and maize and beans to a lesser extent. Fruits, vegetables and root crops primarily serve home consumption and are rarely sold (s. Box 2, p. 34). Given these similarities, the means of sustainable intensification as promoted by MISEREOR's partners certainly make a difference at this point. In contrast, outgrowers primarily rely on tea (37%) supported by smaller shares of maize, coffee, meat and eggs. When assessing their farm income however, one has to bear in mind the low farm gate prices received in 2014 (s. Annex 3). Consequently, one can assume that returns from contract farming might usually be somewhat higher.

The comparison of off-farm income displays rather moderate and more equally distributed advantages of SA farmers over the reference group which range from 55 to 71%. This is most likely to be explained by the fact that all groups have comparable access to off-farm earnings through approximately 1.5 income sources per household (s. Annex 15). Therein, SA growers are most likely to receive remittances and rely less on casual labour. Due to the high labour intensity of the tea industry, outgrowers have less time and workforce to spend on other activities. Although a considerable number remains engaged in off-farm income employment, they lack behind the reference group in exploiting the available opportunities.

Eventually looking at the combined total gross income, SA farmers at median level earn 80% more than their counterparts and while the advantage of tea outgrowers accounts for quite modest 18%. Female-headed households lose out in all production systems. Yet, their income drop accounts for only 14% under SA while women in the reference group and among tea outgrowers have to put up with an average

Box 4

The coffee sector

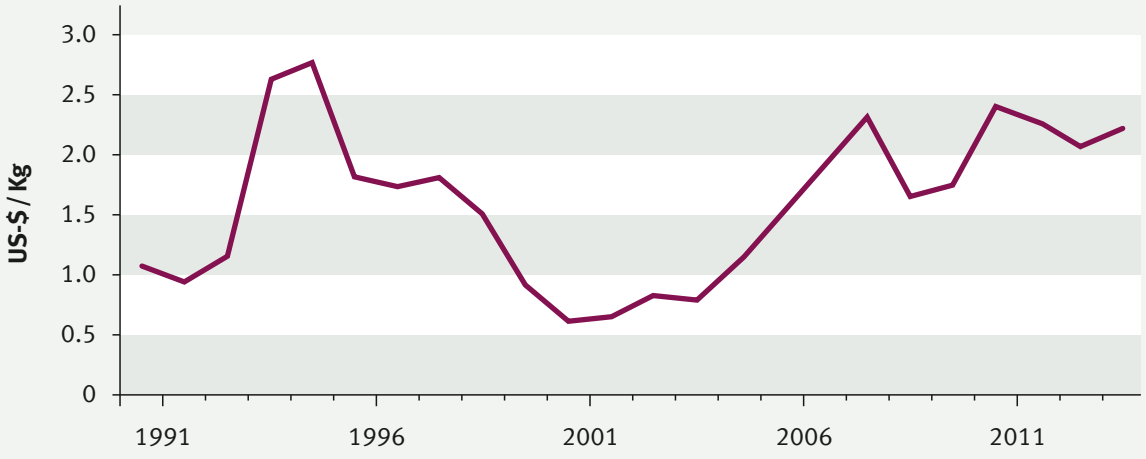
The development of the coffee industry shows similar patterns as the tea sector described in section 2.2. Commercial production started under colonial rule and emerged as the country's main foreign exchange earner in the early 1950s. Under the first Obote government the sector gradually underwent nationalization and all related branches were subordinated under state-run authorities. The erratic policies of Idi Amin resulted in general decay and excessive smuggling of produce to neighbouring Kenya. By the early 1980s the industry had almost collapsed (BYRNES 1990).

From 1984 onwards the Museveni administration tried to revitalize the sector through donor-funded rehabilitation programmes which were tied to far-reaching deregulation. This included the dissolution of the state-run marketing board, privatization of processing facilities and far-reaching removal of export taxes and levies. Although market liberalization significantly increased producers' share in export prices, it exposed them to the volatility of the world market (VARGAS HILL 2010).

Despite diversification policies coffee remains Uganda's top earning commodity accounting for 18% of total export revenues. *Coffeacanephora's* growing regions cover much of Central, Eastern, Western and South-western Uganda, including this study's research areas (s. Fig. 1). Commonly known as robusta it constitutes about 80% of national production. The more high-grade arabica variety is exclusively grown on the higher slopes of Mt. Elgon, Mt. Muhabura and the Rwenzori Range. Both cultivars have two harvest seasons with a main crop from October to January and the less productive fly crop from May to July. While multinational companies focus on processing and export, production mainly relies on about 500,000 small-scale farmers of which 90% own less than six acres of land. In total, the industry contributes to the livelihoods of 3.5M households.

Unlike in neighbouring Kenya and Tanzania, the Ugandan coffee sector is extensively deregulated. Market liberalization was accompanied by the collapse of the cooperative sector which gave room to a large number of small- and medium scale enterprises involved in domestic trade and processing. Thus, smallholders usually sell to individual traders who, depending on their location and capacities, collect and transport the dried cherries to millers, larger distributors or exporters in Kampala. The latter in turn contract carriers to facilitate transport to Mombasa port in Kenya (FAO 2012b).

Besides infrastructural deficiencies and inefficient processing and marketing, the complex design of the coffee value chain has been blamed for both, the comparably high costs of Ugandan robusta as compared to the produce of Asian competitors and the imperfect transmission of profits to the farm gate. According to FAO 2012b farmers received between 64 and 88% of the Kampala export price from 2005 to 2011. Yet, the benefits of favourable market situations tend to be captured by exporters and domestic traders while price decreases are generally passed on to producers.



Robusta World Market Price (US-$/Kg) since Liberalization 1991

Data: World Bank 2016

While most of them have diversified their sources of income, 75% of small-scale farmers still grow coffee on a small piece of land.

19 and 29% respectively. Thus, one can suppose that the SA approach managed to produce specific positive effects for women.

The data presented here proves that investments into sound and context-sensitive agricultural extension programmes yield considerable returns on the micro and on the macro level. This becomes clear when looking at both, the hidden monetary benefits of self-sufficiency and the commercial revenues of highly diversified farming systems. Both primarily enhance food security and income generation for the poorer parts of rural populations. The values for tea outgrowers follow a similar path but at significantly lower levels. Apparently, at least under the current tea price regime, outgrowers in the lower income groups restart diversification as it spreads production risk and offers higher returns than specialization. Since tea prices are likely to fluctuate considerably also in future, tea farmers strategy has to be seen as minimizing market risks.

For the purpose of illustration: The median grand total income of a household practicing sustainable agriculture accounting for some USh 8M exceeds that of P4 medium level teachers in rural areas (USh 7.3M). Calculated as the grand total income per head per day SA farmers exceed the Ugandan rural poverty line of US$ 1.00 and closely approach the current global poverty line of 1.25US$ as defined by the World Bank. While these median revenues account for US$1.23/day, the disparity between the lower and the upper 10% is tremendous, ranging from US$ 0.52 to over US$ 3.39 daily, which means that the most well off percentile earns almost 7 times the value of the poorest section within the rural economy.

When assessing the net income of farming households their monetary investments into additional workforce, seeds, chemicals and livestock have to be taken into account. Looking at the absolute numbers, one has to recognize that despite the previously observed income effects, the lowest percentiles of smallholders across all groups rarely reinvest into farming-related activities (s. Tab. 17). Apparently, many of the less resourceful households use their scarce funds to satisfy more urgent needs, such as additional food purchases. However, it is evident that even underprivileged SA farmers and outgrowers at the tenth percentile spend six to seven times as much on agricultural inputs than the reference group.

This applies to livestock-related investments and permanently or temporarily hired external labour. Surprisingly, SA farmers not only devote four times more resources to livestock but also spend more on hired labour. Expenditures on seeds are rather modest and, due to improved storage facilities, smaller among project participants than in the reference group. With regard to chemical inputs the successes of partner organisations in promoting organic farming practices are less clear. Whereas smallholders engaged in sustainable agriculture invest 40% less into fertilizer, pesticides and herbicides at median level, they surpass their conventional farming counterparts in the upper percentiles. This finding underlines the trend identified in section 5.3 whereby SA farmers, due to crop diseases, general labour shortage and competing purposes for the use of crop residues increasingly apply non-organic modes of production. Although it seems as if chemical inputs, fertilizers in particular, are primarily applied by the well-endowed SA farmers and tea outgrowers' investments in this regard are much bigger and widespread (s. Tab. 17) this result certainly provides food for thought.

In spite of the fact that SA farmers re-invest substantial amounts into agriculture the net income values at median level show a similar picture to the gross income statistics whereby project participants' revenues are 77% higher than those of the reference group (s. Annex 16). In the lower income percentiles, the advantage even reaches up to 180%. The results become even clearer when calculating the net income per area unit cultivated. Especially smaller SA farms of less than two acres obtain twice as much as both, reference and outgrower holdings because integrated farming systems comprising agroforestry and livestock can

Table 15
Total net income per acre cultivated

Acres	Reference (USh)	SA (USh)	Outgrower (USh)
< = 1	1,889,400	3,952,500	1,487,100
1-2	878,231	2,258,300	1,110,400
2-4	692,966	1,333,900	965,922
> 4	615,378	773,048	552,925

be thoroughly managed using family labour at this scale (s. Tab. 15).

Besides what is displayed in Tab. 14 and 15 many SA farmers are in a unique position when it comes to attaining new plots, both via purchase and rent. They spend six times more on land acquisitions and thus, also have the highest interest burdens across all groups, while the reference group is not investing at all. While SA farmers' ability to acquire additional land is a positive development, this might lead to further social stratification and requires careful monitoring.

Hence, in spite of some few unfavourable tendencies, the mere fact that a vast majority of SA farmers are eventually able to re-invest into the foundation of their livelihoods represents a remarkable development compared to the first assessment in 2005 where overall spending were much lower and primarily focused on satisfying basic needs. However, it is important to note that Uganda was hit by a prolonged dry season and the 2015 survey's methodology was more sophisticated than earlier one. While both aspects limit the validity of these results to a certain extent, the generally positive picture was confirmed by the survey participants themselves. 81% of SA farmers assess their income situation to be better than ten years ago. This is only the case for 40% of outgrowers and 33% of the reference group whereby half of the latter two even stated that their income declined within in the last decade (s. Annex 17).

Eventually, an attempt to tackle the question which social, economic and agricultural factors determine income generation has been made by means of multiple linear regression as shown in Fig. 8. In this case, livestock ownership, membership in marketing groups and land size stand out as the variables of statistical significance for all farming households. The findings presented here underline the potential of integrated farming systems and the central role of livestock therein. However, when assessing the technical portfolio promoted by MISEREOR partners in this regard, zero-grazing can be identified as the most notable driver of income generation while the cultivation of fodder crops seems to have a detrimental effect (s. Annex 18). This paradox finding may reflect the previously outlined risk landscape (s. Section 5.1) whereby both livestock numbers and land availability have been substantially reduced in the last decade. While intensified livestock husbandry in the form of zero-grazing certainly has monetary benefits for farm-

Table 16
Socio-economic factors' impact on income

	Beta Coefficient	t	Sig.
Number of livestock	.102	2.475	.014
Membership in marketing group	.089	2.182	.029
Size of land owned	.088	2.475	.042
Age of head of HH	.072	1.815	.070
Pesticide application	.067	1.759	.079
Number of crops	.033	.763	.446
Agricultural labour units	.024	.619	.536
Education of Head of HH	.014	.375	.708
Sex of head of HH	.000	-.009	.993
Fertilizer application	-.019	-.495	.621

Adjusted R^2: .059; model Sig.: .000

Table 17

Expenditure on selected food or non-food items* comparing SA and outgrowers with farmers of the reference group

Expenditure items	Group	25P	50P	75P
Farm Inputs				
Hired labour	SA/R	[52,500USh]	+1,233%	+161%
	OG/R	[16,000USh]	+856%	+150%
Livestock	SA/R	[18,500USh]	+1929%	+260%
	OG/R	[ ]	+471%	+60%
Sprays and fertilizer	SA/R	[ ]	-40%	+13%
	OG/R	[30,000USh]	+1550%	+493%
Total farm inputs**	SA/R	+301%	+179%	+163%
	OG/R	+348%	+158%	+87%
Food items				
Bananas	SA/R	[ ]	[ ]	[ ]
	OG/R	[ ]	[ ]	-53%
Meat and fish	SA/R	+100%	+62%	+50%
	OG/R	+60%	+6%	+52%
Vegetables and root crops	SA/R	[ ]	[ ]	-52%
	OG/R	[ ]	+267%	54%
Total food items**	SA/R	17%	6%	7%
	OG/R	15%	16%	13%
Non-food items				
Education	SA/R	+187%	+200%	+254%
	OG/R	+46%	+20%	+24%
Health	SA/R	+25%	+8%	+11%
	OG/R	+25%	+24%	+39%
Mobility	SA/R	+50%	+82%	+64%
	OG/R	+24%	+46%	+3%
Total non-food items**	SA	+76%	+110%	+104%
	OG/R	+24%	+11%	-2%
Total Expenditure				
Total expenditures**	SA/R	+82%	+93%	+81%
	OG/R	+36%	+32%	+13%

* Values in [brackets] represent cases where the respective value for the reference group is zero. Empty brackets [ ] represent cases where both values are zero.

** Values displayed in this column have been assessed separately in the survey and thus are not based on the sum of the exemplary categories displayed above.

Photo: H. Schwarzbach/MISEREOR

Matoke remains the main staple crop, and provides regular income throughout the year for small-scale farmers.

ing households, fodder crops further reduce the scarce land resources available. Hence, there is a need to make livestock keeping more profitable, e. g. through improved forage development or marketing of dairy products. At the same time, greater attention has to be paid to improved storage, processing and marketing of crops in demand on local markets.

Due to the strong variations in income, expenditure patterns show high fluctuations as well. Looking at the median to assess total annual household spending SA households purchase for about 3.5M USh, outgrowers spend 2.4M USh and reference farmers use 2.2M USh. The median expenditure for most food crops is zero because farmers produce sufficient quantities themselves and thus, do not need to buy any. Hence, the upper percentiles do not necessarily represent the high income parts of the population but those who rely on the market to cover their needs. For example, this is the case for almost all SA farmers with regard to meat but only for 20% in the case of bananas. The benefits of MISEREOR's focus on crop diversity and food security become apparent when comparing the median cash amounts devoted to the purchase of vegetables and root crops like cassava and sweet potato. While project participants are completely self-sufficient, tea growers spend over 2.5 times as much as the reference group (s. Tab. 17). A similar picture presents itself in the cases of maize, beans and groundnuts. As a result, SA farmers, especially in the lower percentiles, are able to spend substantially more on livestock products and other food items such as sugar, salt and cooking oil.

The advantages are even more visible with regard to non-food items which constitute 60% to 70% of total expenditures for all groups. At median level and in the upper percentiles SA farmers, spend twice as much as the reference group while the advantages of outgrowers are negligible. Most notably, those farmers working with MISEREOR partners heavily invest into their children's education and clearly outperform the two other groups in this regard (s. Tab. 17). While tea outgrowers' tend to have slightly higher health expenses, SA farmers also appear to enjoy greater mobility. Last but not least the superior financial situation of SA farmers manifests itself in terms of savings. On median level and above project participants were able to save at least four times more than both comparative groups (s. Annex 19). Yet, one has to keep in mind that the less resourceful households across all groups still lack the funds to invest in most of the assessed item categories and are unable to make any savings at all.

6 Conclusions

The present study evaluated the impact of project interventions by MISEREOR partners in ten districts of Uganda over the last 20 years. It provides field-based evidence to the question of how agricultural growth and structural transformation of rural areas can be facilitated in a profitable, environmentally friendly and socially inclusive way. Thereby, the livelihoods of project participants embracing sustainable means of agricultural intensification were assessed in comparison to a conventionally farming reference group and members of various tea outgrower schemes.

Photos: L. Bachmann/MISEREOR

Cutting of elephant grass helps to reduce costs for fodder becoming increasingly scarce.

The results show that external factors such as drought and crop diseases generally present the major risks for all three groups of farmers. Tea farmers, due to their economic specialisation, are additionally exposed to market-related risks. Manifold effects such as low farm gate prices, high costs for agricultural inputs and insufficient service provision by the processors result in the far-reaching loss of promised contract farming benefits.

Shortages of land and labour also pose an increasing challenge to all smallholders. Through inheritance, plots become gradually fragmented which leads to the out-migration of youths in some places. While households allocate almost half of their workforce towards off-farm income sources, external labour is only affordable for the better off. Especially tea farmers are currently unable to satisfy their high demand in this regard. Labour requirements for sustainable agriculture, however, are only marginally higher than for conventional farming systems. Hence, contrary to the arguments of sceptics (GILLER ET AL. 2009), locally-adapted means of sustainable farm management are not necessarily more labour intensive than conventional or high-external input approaches in the long run. Initial obstacles to investment in terms of capital, material or workforce can be overcome with the support of context-sensitive and socially inclusive advisory systems which provide the necessary services over a limited period of time (RAUCH and KERSTING 2016). Against this background, the extension approaches of MISEREOR partners proved to be predominantly successful, whereas service provision by both, public and private stakeholders, generally has to be considered insufficient.

While agrobiodiversity is limited on all three farm types, crop diversity is certainly higher on farms engaged in sustainable agriculture and was maintained over the last ten years. Yet, ongoing land fragmentation and lack of direct commercial benefits have affected many of the programmes' earlier achievements in introducing agroforestry species, fodder grasses and nitrogen-fixing legumes. A similar downward trend can be observed regarding livestock. Nonetheless, SA farmers still own twice as much cattle and goats as the other two groups. While most techniques comprised under sustainable farming systems show high adoption rates, the ones for zero-grazing, indicate unexploited potential. Apparently, the investment costs associated with animal shelters and additional fodder purchase constitute obstacles difficult to overcome by small-scale farmers own means. Considering the growing number of biomass consumers per unit area, the revitalization of fodder crop cultivation becomes even more essential to make other crop residues available for mulching, composting and other means of increasing soil organic matter. Eventually, fertilizer, herbicides and pesticides are also increasingly used, but limited to the better off within all three groups. Hence, integrated and sustainably intensified farming systems offer not only an environmentally friendlier and more diverse but also a viable alternative.

The benefits of sustainable agriculture become visible in terms of crop failure mitigation. Although average productivity for all groups declined dramatically in the wake of the banana wilt disease, SA farms still produce much bigger amounts. On the less productive ones, harvests even increased compared to ten years ago. Besides staple crop production, remarkable improvements have been made in the field of nutrition as diets – including livestock products – became much more diverse and domestic practices concerning water and sanitation were improved. Apart from education, crop diversity and organic means of pest management proved to be the main drivers of enhanced availability and quality of food. This result also holds true for peri-urban Kampala and is thus, contradicting the argument presented by QAIM ET AL. 2016 who claim a superior effect of market access as compared to crop diversity. Summarizing, the vast majority of farmers embracing manifold and sustainable agriculture can be considered food secure.

The monetary advantage of sustainable agriculture over reference and tea farmers manifests itself in terms of both, home consumption values and cash income from farming activities. This finding coincides with results from central Kenya where returns from organic high-input farming are twice as high as under comparable conventional conditions (FIBL 2016). Banana cultivation and livestock form the basis for raised income in the study at hand. The benefits are remarkable and especially evident among the lower income groups. Even though SA farmers reinvest heavily into agriculture, especially in livestock and external labour, the distribution of net incomes shows very similar patterns. Accordingly, profitability is highest on farms of less than two acres because these can thoroughly manage integrated production systems by utilizing family labour only. Education, marketing and access to land are drivers contributing to increased income across all groups. As a result of their favourable situation, SA households spend much less on basic foodstuff, are more able to invest into non-food items and build up savings. Hence, diversification is not only a measure of risk spreading but also entails higher dividends than specialization under the current tea price regime.

In short, the SA approach most importantly managed to mitigate negative external impacts on smallholders in the fields of agrobiodiversity, livestock ownership and productivity of bananas. It successfully addressed all pillars of food security and enabled farmers to exercise their right to food as it increased production, raised incomes and diversified nutrition. With regard to productivity and income, it proved to be particularly beneficial to the less resourceful households and thus can be described as inherently "pro-poor". Although female-headed households still are in a disadvantaged position among SA farmers, their situation showed significant advantages in comparison to the other groups.

Each agro-ecological zone such as sloping terrain in Kabale needs site-specific solutions

These findings demonstrate that environmentally friendly and socially inclusive means of agricultural intensification can very well trigger rural growth and therefore have the potential to facilitate structural transformation. Indeed, under the current situation of the tea market, it also exceeds the respective outgrower scheme in profitability. Another important advantage certainly is the risk spreading character of diversified and highly integrated farming systems over specialized means of production which are also highly dependent on external inputs. However, an *inclusive transformation* by means of sustainable agriculture will most likely realize its full potential under altered institutional and economic framework conditions. Thus, policy recommendations for public authorities in Uganda and Germany as well as for MISEREOR and its local partners are introduced hereafter.

7 Policy Recommendations

Based on the empirical findings and the concluding remarks as outlined above, *MISEREOR and its partners* should continue to support smallholders in intensifying their farming systems by means of context-specific Sustainable Agriculture (SA). However, there is room for further improvement and underutilized potential in certain respects. More specifically the following aspects should be considered:

- Emphasize livestock integration including zero-grazing and forage development in extension messages to compensate for the detrimental effects of land fragmentation. The empirical results showed that adoption levels are comparably low and existing potential remains untapped. Elaborate options to support resource-poor farmers in constructing animal shelters in the form of credit or in-kind. While realizing these opportunities, principles of climate-smart livestock husbandry should be considered.
- Intensify efforts to enable farmers to successfully process and sell their produce since participation in marketing groups showed tremendous effects for income generation. Thereby, pay particular attention to the participation of poor and marginalized households within marketing groups.
- Facilitate farmer-led research on possible means to combat the banana wilt disease. The results regarding organic pest management and application of pesticides have been ambiguous and require further investigation. Farmers should be encouraged to grow greater number of banana varieties. Alternative crops like sweet potato and cassava will have to be considered as substitutes. Further, the apparent relationship between composting and banana yield losses calls for in-depth examination.
- Acknowledge that fertilizer use among SA farmers is increasing and probably not to be detained. Where appropriate, provide recommendations on targeted and locally-adapted application as a complementary element to organic farming methods. Also explore the possibilities for small-scale mechanization as well as reviving communal work arrangements to ease household labour burdens and the use of herbicides.
- SA farmers proved to have superior access to land, education and off-farm income. Special attention has to be paid to not only address the more resourceful within the community in order to honour social inclusiveness as core strength of the approach.

Against the background of the difficult economic situation for tea farmers as described in this study, the *government of Uganda through the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)* should reorient its policies towards the guiding principles of inclusive transformation as outlined in section 3.1. Priorities in this regard may include the following:

- Revise the National Agriculture Policy, the Agricultural Sector Development Strategy and Investment Plan and sector policies in order to explicitly address the issue of resource-poor smallholders who thus far have been neglected by current policies. Therein, recognize their capacities to boost area productivity through sustainable intensification and develop tailored approaches for their support. This should also entail the review of existing inheritance and land rights policies to stop further land fragmentation.
- Increase public investment in agriculture and fulfil the commitments made to the Comprehensive Africa Agriculture Development Programme with the signing of the Maputo Declaration. The additional funds should be used to strengthen the National Agricultural Advisory Services and improve rural infrastructure among others.
- Acknowledge the endogenous potential of smallholders to stimulate agricultural growth as illustrated by the remarkable successes documented in this study and thus, review the role of large-scale private enterprises and foreign capital in the

respective policies. Where smallholders engage in contract farming arrangements that involve far-reaching specialization and dependency on external inputs, both government and private sector should develop safety measures to reduce farmers' vulnerability to market-related risks.
- Shift the current policy focus from fertilizer promotion as a means of agricultural intensification to more environmentally sound approaches. Fertilizers should only be promoted in small and targeted doses based on comprehensive assessments of local soil quality, water availability and crop requirements not as a panacea to increase productivity.
- Scrutinize the current optimism regarding tea outgrower schemes against the back-drop of this study's empirical results and the climate change projections outlined in section 3.3. Reorient agricultural policy towards alternative crops which contribute to national food security, entail less market risks for farmers and are more climate-resilient.

The evidence presented in this study provides good reasons to be confident about the SA approach's economic effectiveness to facilitate sustainable structural transformation of rural areas. Thus, the *German government through the Federal Ministry for Economic Cooperation and Development (BMZ)* should review its current policies and initiatives and clearly commit to the guiding principles of inclusive transformation as described in section 3.1. In detail, this entails the following specifications:

- Develop a strategic document on how to support socially inclusive, economically viable and environmentally sound structural transformation in developing countries to guide current and future interventions of German international cooperation in the fields of agriculture, food security and rural development. The new policy would benefit from close consultation with civil society which can contribute valuable field experiences.
- Give greater emphasis to organic farming methods making them the primary technical approach of German international cooperation. As described in section 3.2, these are currently recognized as complementary options only and thus, the current orientation of development efforts cannot be described as inherently sustainable. This does not mean to completely abandon conventional farming methods but to evaluate their appropriateness for local contexts more thoroughly.
- Shift focus of development policy from contract farming to cooperatives and other forms of farmer organisation. These grant greater self-reliance, participation and flexibility to their members than contracts where farmers, e. g. with regard to service provision, do not have the means to hold their partners accountable.
- Ensure that ongoing cooperation programmes, especially those based on the value chain approach explicitly include resource-poor farmers and their households. This presents a huge challenge in practice, since buyer requirements often can only be met by the better off within the respective communities.
- Where contract farming is bound to extensive specialisation, make the existence of social safety nets towards climate and market risks a compulsory requirement for funding and other means by support on behalf of the German federal government.

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Appendices

Annex 1: **Calculation of Farmers' monetary Share of the Value Chain** (Data: s. b.)

	2010	2011	2012	2013	2014	average
average auction price for ugandan tea*	1.75	1.75	1.75	1.75	1.75	1.75
after quantity adjustment (x 0,23)**	0.4	0.4	0.4	0.4	0.4	0.4
average farm gate price USh/Kg***	270	338	323	290	290	~ 300
average farm gate price USD/Kg***	0.12	0.13	0.13	0.11	0.11	0.12
investment costs family labour****	0.02	0.03	0.03	0.02	0.02	0.02
investment costs hired labour****	0.07	0.08	0.08	0.06	0.06.	0.07
% farm gate price/auction price	30%	32%	32%	28%	28%	30%
% family farm profit/auction price	25%	25%	25%	23%	23%	24%
% hired labour farm profit/auction price	13%	13%	13%	13%	13%	13%

* Estimate from Ezra et al. 2014

** from FAO 2012

*** of four tea factories surveyed, exchange rate from oanda.com

**** based on an average 19% and 58% respectively, s. Annex X

Potential improvement of farm gate prices through eradication market development gap as estimated by FAO 2012: 0.4USD/100*8.5 = 0.03; 100/0.12USD*0.03 = 25%.

Annex 2: **Cost/Benefit Calculation for a 1 Acre Tea Farm**

Activity	Quantity	Hired Labour		Family Labour	
		Low yield	High yield	Low yield	High yield
25/5/5 fertilizer	8 bags à 50kg x 15,000		120,000		120,000
Herbicide application	3 x 15,000	45,000	45,000	45,000	45,000
Costs weeding labour		80,000	80,000		
Labour costs plucking	2000kg à 80 UShs kg	160,000			
	4000kg à 80 UShs kg		320,000		
Pruning yield loss	(25% of total yield)	50,000	100,000	50,000	100,000
Pruning labour costs		22,222	22,222		
Total cost*		**357,222**	**687,222**	**95,000**	**265,000**
(as % of total revenue)		59%	57%	16%	22%
Revenue					
Yield without fertilizer	2000 kg x 300 UShs	600,000		600,000	
Yield with fertilizer	4000 kg x 300 UShs		1,200,000		1,200,000
Gross margin profit		**242,778**	**512,778**	**505,000**	**935,000**
(as % of total revenue)		41%	43%	84%	78%

* Costs for the Establishment of Tea Plantations are not incorporated at this point but can be considered to be substantial.

Annex 3: **Farm Gate Prices paid by five Tea Factories** (Data: Field Survey 2015)

Year	Masaka*	Kabale	Fort Portal	Hoima*	Mityana
2015		300	280	325	290
2014	180	300	280	300	320
2013	180	410	440	315	320
2012	180	410	440		260
2011	180	280	440		260
2010	180	280	440		260
2009	180	200	480		260
2008	110	200	480		260
2007	110	200	480		260
2006	110	200	480		260
2005	100	1996 = 160	480		230

* Masaka Factory went bankrupt in 2015; Hoima Factory was opened as recently as 2013.

Annex 4: **Number of farmers reached with PRA focus group discussions**

	SA	OG	Total
Masaka	14	11	25
Kabale	25	10	35
Fort Portal	37	12	49
Hoima	11	6	17
Afird	18	-	18
Kampala	15	17	32
Total	**120**	**56**	**176**

Annex 5: **Sample Size and Distribution**

	Household Survey			
Partners	**R**	**SA**	**Outgrowers**	**Total**
AFIRD	42	42	0	84
Hoima	42	42	42	126
Kampala	42	42	42	126
Kabale	42	42	42	126
Masaka	42	42	42	126
Fort Portal	42	42	42	126
Total	**252**	**252**	**210**	**714**
in %	35,3	35,3	29,4	100

Annex 6: **Household Survey Questionnaire**

	ADMINISTRATION: general section										
1.	Questionnaire number										
2.	Implementing partner	1 Afird				4 Kabale					
		2 Hoima				5 Masaka					
		3 Kampala				6 Fort Portal					
3.	District										
4.	Sub-County										
5.	Village/Zone										
6.	Date of survey										
7.	Name of enumerator (tick)	1	2	3	4	5	6	7	8	9lb	10dk
8.	Category of farmer	Reference				SA		Outgrower			
9.	Name of the head of household										
10.	Age of interviewee										
11.	Sex of respondent	Male				Female					
12.	Marital Status	1 Single		2 Married		3 Separated		4 Widowed			
13.	Education level of head of household	1 None				4 A-level					
		2 Primary/ability to read or write				5 College (tertiary education)					
		3 O-level				6 University					
14.	No. of household members (adults)		15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	› = 64	Grand total		
		M									
		F									
14.1	No. of household members (children)		0 - 1	2 - 5	6 - 10	11 - 14	Grand total				
		Girls									
		Boys									
15.	How many children attend to school ?										
14.2	If any children have finished school, what education levels have they reached so far? *Fill number*	2 Primary				5 College (tertiary)					
		3 O-level				6 University					
		4 A-level				7 Profession					

	LABOUR					
16.1	Family labour available	Husband (estimate % time or hours per day)				
		On farm		Outside		
		Wife (estimate % time)				
		On farm		Household		
		Children (estimate % time)				
		School		On farm		
16.2	Hired labour	No of permanent labourers				
		Estimate hired labour days season 1 Workers*days				
		Estimate hired labour days season 2				
		Free exchange of labour with other farmers		(days per year)		

	LAND						
18.2	Validate an acre. What are the dimensions?	Calculate sq metres:					
22	Total land used for crops (cross check later)	Acres					
18	Total land owned	Acres					
18.1	The land owned is divided into how many different plots	Plot	1	2	3	4	5	6
		Acres						
19.	Did you buy any land in the last 10 years?	Acres						
19.1	Did you sell any land in the last 10 years?	Acres						
21.	Acres of land borrowed freely yourselves from other farmers or relatives	Acres						
21.1	Acres of land rented from other farmers	Acres						
23.	Land used for grazing only	Acres						
23.1	Do you have access to communal grazing land?	Acres						
24.	Land used for fallowing only	Acres						
24.1	Land under forest or woodlot	Acres						
22.1	Total land under tea	Acres						
22.2	Age of tea plantation (years)							

	LIVESTOCK				
26.	No. of cattle (including calves)	Today		2005	
27.	No. goats	Today		2005	
28.	No. of pigs	Today			
29.	No. of poultry	Today			
30.	No. of rabbits	Today			
31.	No of sheep	Today			

	ASSETS				
33.	Is your house owned or rented ?	owned		Rented	
34.	Quality of main housing? Tick multiple choice	1 Permanent		4 Thatch for roof	
		2 Mud and poles for walls		5 Rammed earth for floor	
		3 Iron sheet roofs		6 Permanent floor	
35.	Assets: What of the following items do you own today?	Items	#		#
		Bicycle		Wheel barrow	
		Motor bike		Farm storage structure	
		Motor car		Zero grazing stable for goats	
		Solar		Zero grazing stable for cows	
		Radio		Water tank	
		Television		Food processing equipment	
		Phone, mobile		Tractor (4 wheel)	
		Living room furniture		Small 1 axis 2 wheel tractor	

	FOOD SECURITY					
36.1	Food security: did you have any months with food shortage where your own crops where not sufficient to feed the family? If yes, enter number of months (e.g. 1.5)?		2014	2013	2012	
		1. Season				
		2. Season				
36.2	Do you think that your food security has improved in the last 5-10 years?	Decrease	The same	Yes, a little better	Much better	Excellent, always fully secure

38.	Do you think you have a healthier diet today compared to 10 years ago? Do you eat more of any of the following food items?	Yes, eat more	Eat the same	No, eat less
	More cereals (maize, millet)			
	More groundnuts, beans			
	More matoke			
	More root crops (cassava, yams, potato)			
	More vegetables			
	More fruits			
	More eggs			
	More meat			
	More dairy products			

	EXTENSION approaches									
42.	Intensity of extension over time (all methods combined in the last 10 years	Year/ Freq.	06	07	08	09	10	11	12	13	14
		10-12									
		7-9									
		5-6									
		3-4									
		1-2									
		0									
43.	Who of the organisations gives you most extension service (rank 1-5) No service = rank 5				Rank 1-5 all items					
		Project Partner									
		Government									
		Media, Radio, TV									
		Private input sellers									
		Other NGOs									
43.1	Tick frequency of service of second best service provider after project partner	1 Never				4 Twice a year					
		2 Once every 2 years				5 Regular quarterly					
		3 Once a year				6 Regular monthly					

	CROPS								
45.	Which annual/seasonal crops did you cultivate in 2014 in either of the seasons? Tick first, then take acres, last take varieties for 3 crops with largest area Note smaller areas than 1/4 acres as small with s	Crop	Tick	Var.	Acres	Crop	Tick	Var.	Acres
		Banana				Cabbage			
		Maize				Tomato			
		Millet				Onion			
		Sorghum				Eggplant			
		Rice				Carrot			
		Sweet potato				Traditional afr. vegis			
		Irish potato				Sukumawich			
		Yams				Water melon			
		Wheat				Pineapple			
		Barley				Pumpkin			
		Beans				Chili peper			
		Soya				Passion			
		Groundnuts				Bitter berries			
		Sugarcane				Tobacco			
		Cucumber				Cotton			
		Cassava				Sunflower			
		Other *specify*				Green peper			
						Vanilla			
45.1	What of the following tree crops have you cultivated? *Don‘ t fill varieties*	Crop	Tick	Var.	Acres	Crop	Tick	Var.	Acres
		Avocado				Guava			
		Paw paw				Cashew			
		Mango				Macademia			
		Coffee				Jack fruit			
		Tea				Palm oil			

	CROPS								
45.1	What of the following tree crops have you cultivated? *Don‘ t fill varieties*	Crop	Tick	Var.	Acres	Crop	Tick	Var.	Acres
		Oranges				Cocoa			
		Lemons				Rubber tree			
		Apples				Other *specify*			
46.	Which agroforestry or fodder crops do you cultivate?	Calliandra				*Uganda coral (Muyirikiti)*			
		Gliricidia				*Podocarpus*			
		Leucaena				*Casualina*			
		Tephrosia vogelii, Muluku				Maesopsis eminii (Musisi)			
		Sesbania				Ficus tree			
		Moringa				Motuba			
		Pine				White mulberry, Nkenene			
		Teak				Grevillea robusta, Kalwenda			
		Albizia, Mugavu				Eucalyptus. Kalitunsi			
		Neem tree				Candle nut tree (Kabaka anjagala			
46.1	Grasses	Kikuyu grass				Guinea grass			
		Napier grass				Russian comfrey			
		Setaria				Other *specify*			
		Lemon grass							
46.2	Legume fodder	Lab lab				Jack bean			
		Mung bean				Velvet bean			
46.3	Other species	Aloevera				Oregano			
		Pepermint				Other			

	SA PRACTICES and adoption			
47.	Do you use chemical fertilizer ? Specify quantity used per year (both seasons combined) Copy quantity to expenditure Q631	Y/N		
		If yes, specify	No sacks of x kg	
		Liquid fertilizer	(litres)	
		N/P/K (15/15/15)		
		N/P/K (25/5/5) tea		
		Urea (46/0/0)		
47.1	How did you fertilize your soils in 2014 in either of the two seasons Tick		Own production	Purchased
		Compost		
		Animal manure		
		Organic settlement residues / garbage		

	SA PRACTICES and adoption			
48.	How did you control pests? (MC)	Integrated pest management IPM		
		Crop rotation		
		Chemical pesticides		
49.	How did you control weeds? (MC)	Hand weeding		
		Mulching		
		Chemical herbicide		
Next section only for SA				
51.	In what of the following SAP practices were you trained and which do you apply currently / permanently?	Practices	Trained Y/N	Apply Tool 0-4
		Organic pest control bananas		
		Organic pest control other crops		
		Soil conservation, canal digging		
		Compost		
		Liquid manure		
		Mulching		
		Agro forestry		
		Zero grazing		
		Growing fodder grasses		
52.	What special goats husbandry practices were you trained in, which have you adopted permanently?	Practices	Trained Y/N	Apply Tool 0-4
		Housing		
		Proper feeding		
		Treatment with drugs (deworming)		
		Cross-breading		
53.	Select any of the three animal types. and tick. What special animal husbandry practices were you trained in, which have you adopted permanently?	Cattle	Poultry	Pigs
		Practices	Trained Y/N	Apply Tool 0-4
		Housing		
		Proper feeding		
		Health care (e.g. deworming, deticing, vaccination		
		Give animals water		
55.	Did you receive training on any of the following general topics and what did you adopt ?	Type	Trained Y/N	Apply Tool 0-4
		Farm plans		
		Record keeping		
		Better marketing		
		Improved storage of crops		
		Food processing		
		Advocacy for farmers rights and needs		
		Participation in local government or NAADS meetings		

	SA PRACTICES and adoption			
55.1	Did you receive training on gender and hygiene practices and what did you adopt?	Type	Trained Y/N	Apply Tool 0-4
		HIV		
		Gender relations		
		Hygiene practices		
		Joint decision making at household level		
		Using a rack for dish washing		
		Use of energy saving stoves		
		Clean farm, save disposal of plastics and garbage		
56.1	Do you work together with other farmers and operate a garden in the group?	Y/N		
57	Did you receive any training to improve working in groups	Type	Trained Y/N	Apply Tool 0-4
		Group leadership		
		Proper bookkeeping		
		Managing savings		
		Managing credits		

This section for all again

	MARKETING				
58.	Do you sell any agricultural produce? If yes, Where do you sell your agriculture produce? (tick MC)	I sell	y/n		
		Direct sales to customers at farm gate			
		Individual farm gate to middlemen			
		Myself at local produce market			
		Group sales to middleman			
		Group sales with own stand at market			
		Sell to parent company (e.g. tea)			
58.1	Are you a member of a marketing group?	Y/N			
58.2	How successful do you rate your joint marketing group activities?	Low	Moderate		High
60.	What are your current most pressing agricultural problems? Ask farmer without prompting. Top three; tick list if appropriate	1.			
		2.			
		3.			
		1 Lack of market		12 Poor soil fertility	
		2 Drought/ floods		13 Climate change, unpredictable seasons	
		3 Lack of capital		14 Low product prices	
		4 Lack of seeds		15 Poor roads	
		5 Lack chemical fertilizer		16 Theft	

	MARKETING				
60.	What are your current most pressing agricultural problems? Ask farmer without prompting. Top three; tick list if appropriate	6 Lack chemical pesticides		17 Lack of storage	
		7 Lack of land		18 Lack tree seedlings	
		8 Soil erosion		19 Pests and diseases	
		9 Lack of labor		20 Poor extension service	
		10 Lack organic fertilizer		21 Fake fertilizer, pesticides, seeds	
		11 Price fluctuation		22 Others	

	EXPENDITURE: Household spending (2014 Jan to December)		
63.1	How do you spend your income? Estimate week * 48 weeks *Food items*	Household spending	Value annual
		Buy any of the following	
		Matoke	
		Maize	
		Cassava, Sweet potato, yams	
		Irish potatoes	
		Beans	
		Groundnuts	
		Other cereals, rice, noodles	
		Vegetables (daily *365)	
		Milk	
		Buy meat or fish	
		Salt, sugar, cooking oil, soap	
		Kerosene, electricity, charcoal	
		Transport	
		Taxes	
		Water	
		Housing (rent, upgrades)	
		Contributions to celebrations, funerals	
		Education and related costs	
		Clothing	
		Health care, medicines, treatments	
		Luxury items: radio, TV, bike, etc.	
		Airtime	
		Drinks, leisure	
		Other	
		Total household expenditure (Q631)	
63.2	Farm production costs	Seeds, planting materials	
		Sprays, pesticides	
		Fertilizer	
		Livestock costs, feeds, vaccines, medicines	
		Land rental ; shared payments in kind	

	EXPENDITURE: Household spending (2014 Jan to December)		
63.2	Farm production costs	Buying land	
		Hired labour or permanent labour	
		Repayment of loans	
		Other farm expenses	
		Total farm production costs (Q632)	
63.3		**Total expenditure per year 2014 (Q631 and Q632)**	
		Calc spending per day 2014 (/365)	
63.4		Savings in the bank or cash	
63.5		Debt with bank or any person	

	INCOME: Subsistence value - farm produce consumed (2014 Jan to December)				
63.6	How much of your own farm product do you take for family consumption? Conversion factors: Weekly = 48 weeks a year Education = 10 months a year, monthly incomes 12 months		Unit measu-re(Kg per unit)	Price per unit	Value
		Matoke			
		Maize			
		Beans			
		Cassava			
		Sweet potato			
		Yams			
		Irish potatoes			
		Groundnuts			
		Other cereals (rice, millet, etc)			
		Millet			
		Sorghum			
		Vegetables (daily *365)	xx		
		Fruits (Avocado, mango etc.)	xx		
		Milk			
		Poultry, meat or eggs			
		Pigs, goat meat			
		Processed product (beer, wine, juice, dried fruits etc)	xx	xx	
		Feeds for livestock (value root crops, no green fodder)	xx	xx	
		Seeds	xx	xx	
		Organic Fertilizer	xx	xx	
		Wine, beer, local brews	xx	xx	
		Total value home consumption (Q636)			

Compare Expenditure and cash income and calculate balance

64.5	**BALANCE TOTAL INCOME (Q642)** LESS EXPENDITURE (Q633)	Recalculate in case of big deviations!

64.6	How do you estimate that your income has changed compared to the year 2005?		1 Decrease	2 The same	3 Better	4 Much better
		Farm income				

	CASH INCOME estimate (2014 Jan to December)			
64.0	Other income sources	Small business		
		Remittances		
		Employment (net)		
		Casual labour		
		Others, specify		
		Loans received (money borrowed)		
		Calculate total off-farm income (Q640)		

64.1	Farm income	Farming crops	Quantity and frequency	Price	Value annual
			No months		
	Annual income	Tea high production			
		Tea low production			
		Milk high production			
		Milk low production			
	First season	Matoke sold			
		Crop 1			
		Crop 2			
		Crop 3			
		Crop 4			
		Crop 5			
	Second season	Matoke sold			
		Crop 1			
		Crop 2			
		Crop 3			
		Crop 4			
		Crop 5			
	Annual estimate minor crops				

	EXPENDITURE: Household spending (2014 Jan to December)			
64.1	Selling animals or animal products (cattle, goat, pig, poultry, meat, honey, eggs etc.)			
	Fishing or other aquatic animals			
	Drinks, wine, processed or packed foods			
	Other products (timber, processed agric. Produce)			
	Calculate farm total (Q641)			
64.2	Total income per year off-farm and farm (Q640+Q641)			
64.3	Total income per day Divide above (Q642) by 365			
64.4	Wage for full daily labour if hired			

	CROP YIELDS				
	Crop yield comparison	*Yield in Bunches*	*Area of harvest*	*Calculate. Yield bunches*	*Size of bunch* *Small, medium, big*
66.1	Crop 1 Matoke / Tea 2014				
	2005 or any year prior project				
	2005 or any year prior project				
	Crop yield comparison	*Yield in Kg*	*Area of harvest*	*Calculate. Yield in kg per acre*	
66.2	Crop 2 Specify _____ 2014				
	2005 or any year prior project				

Enter if yield trend before the project to today is **increasing**							
			C1	C2		C1	C2
66.4	Reasons for better yields (MC)	Larger area planted			Better weeding		
		Agroforestry			Better pest management		
		Manure			Better varieties		
		Chem. fertilizer			Better crop husbandry		
		Better soil fertility			Better marketing prices		
		S/W conservation			Other sp.		

Enter if yield trend before the project to today is **decreasing**							
			C1	C2		C1	C2
66.4	Reasons for lower yields (MC)	Smaller area planted			Poor crop husbandry		
		Decline in soil fertility			More pests, diseases		
		Less manure			Poor prices lower interest		
		Less chem. fertilizer			No advice available		
		High input prices			Other		

Thank you so much for the interview!

70.	Comments, observations After interview if any	

Annex 7: **Calculation of labour units**

Age group	0-10	11-14	15-18	19-65	›65
Labour unit	0	0,3	1	1	0,3

Annex 8: **Percentiles for additional workforce**

Percentiles	Reference	SA	OG
Total labour days family and hired labour per year			
5	121	155	140
10	176	216	223
25	264	351	300
50	377	581	454
75	561	941	684
90	818	1395	1023
Number of permanent labourers			
5-50	0	0	0
75	0	1	0
90	1	2	2
95	1	3	4
Seasonal hired labour days per year			
5-10	0	0	0
25	0	4	0
50	1	30	24
75	25	77	84
90	94	240	227
95	181	429	426

Annex 9: **Crops grown on farms**

	Reference	SA	Outgrower
Beans	92.1	96.8	93.3
Banana	82.9	95.2	94.3
Maize	88.9	92.9	82.9
Sweet potato	81.3	89.7	91.4
Traditional African veggies	58.7	87.7	69.0
Cassava	80.6	85.7	86.7
Egg plant	35.7	61.5	41.0
Groundnuts	52.0	58.7	48.1
Pumpkin	29.8	58.7	37.6
Irish Potato	43.3	57.1	57.6

Annex 9: **Crops grown on farms**

	Reference	SA	Outgrower
Yams	29.4	52.0	37.6
Tomato	21.4	44.4	15.2
Onion	12.3	40.5	15.2
Cabbage	13.5	37.7	14.3
Passion fruit	18.7	35.3	22.9
Sugarcane	19.0	29.4	26.7
Pineapple	8.7	27.4	10.5
Green pepper	6.3	27.4	1.4
Sukumawich	6.3	25.4	6.2
Carrot	2.8	25.0	4.3
Millet	20.6	23.4	28.6
Bitter berries	14.7	22.2	13.8
Sorghum	18.7	21.8	19.0
Rice	12.3	17.5	11.9
Tobacco	9.1	14.7	6.7
Chilli pepper	3.6	11.9	7.6
Soya	4.0	7.9	2.9
Water melon	2.4	6.7	1.0
Cucumber	1.6	3.2	0.5
Sunflower	0.8	2.4	1.0
Vanilla	1.2	2.4	0.5
Wheat		1.6	
Barley		0.4	0.5
Cotton		0.4	

Annex 10: **Average area (acre) allocated to crops per year**

	Reference			SA			OG		
	Mean	N	Max.	Mean	N	Max.	Mean	N	Max.
Beans	0.40	224	4	0.56	244	5	0.56	244	5
Banana	0.51	212	4	0.95	239	6	0.95	239	6
Maize	0.65	222	4	0.98	236	10	0.98	236	10
Sweet potato	0.19	202	1	0.30	226	3	0.30	226	3
Traditional African vegis	0.002	146	0.02	0.005	220	0.5	0.005	220	0.5
Cassava	0.28	203	5	0.54	211	25	0.54	211	25
Eggplant	0.02	88	1	0.01	155	1	0.01	155	1
Groundnuts	0.27	129	1.5	0.47	145	4	0.47	145	4
Irish potato	0.42	105	25	0.21	145	2	0.21	145	2
Pumpkin	0.03	78	2	0.01	143	1	0.01	143	1
Yams	0.02	73	0.02	0.07	129	3	0.07	129	3
Tomato	0.16	54	2	0.05	112	2	0.05	112	2
Onion	0.10	31	2	0.10	103	3	0.10	103	3
Cabbage	0.08	31	0.5	0.06	95	1	0.06	95	1
Passion fruit	0.00	48	0.002	0.02	88	0.5	0.02	88	0.5
Sugarcane	0.10	44	2	0.16	71	4	0.16	71	4
Pineapple	0.04	21	0.75	0.39	69	25	0.39	69	25
Green pepper	0.02	16	0.25	0.06	68	1.5	0.06	68	1.5
Sukumawich	0.002	18	0.002	0.002	65	0.02	0.002	65	0.02
Millet	0.17	50	1.5	0.26	64	1	0.26	64	1
Carrot	0.32	7	2	0.01	59	0.25	0.01	59	0.25
Bitter berries	0.00	38	0.002	0.01	57	0.25	0.01	57	0.25

Annex 10: **Average area (acre) allocated to crops per year**

	Reference			SA			OG		
	Mean	N	Max.	Mean	N	Max.	Mean	N	Max.
Sorghum	0.26	45	3	0.31	55	3	0.31	55	3
Rice	0.79	31	4	1.19	44	8	1.19	44	8
Tobacco	1.43	23	25	0.41	36	3	0.41	36	3
Chilli pepper	0.00	10	0.02	0.00	29	0.002	0.00	29	0.002
Water melon	0.002	6	0.002	0.003	17	0.02	0.003	17	0.02
Soya	0.16	10	1	0.20	16	1	0.20	16	1
Other specify	0.15	7	0.5	0.20	10	0.5	0.20	10	0.5
Cucumber	0.01	3	0.02	0.14	8	1	0.14	8	1
Vanilla	0.08	3	0.25	0.08	7	0.5	0.08	7	0.5
Sunflower	0.002	2	0.002	0.002	4	0.002	0.002	4	0.002
Wheat	0.25	1	0.25	0.50	1	0.5	0.50	1	0.5
Barley	0.07	5	0.2	0.02	1	0.02	0.02	1	0.02

Annex 11: **Agrobiodiversity Indicators for fruit trees, agroforestry trees, fodder grasses and legumes**

	Reference			SA			OG
	1995	2005	2015	1995	2005	2015	2015
Avocado	63,9	82,7	86,9	73,7	91,9	92,9	91
Paw paw	61,7	69,5	56	70,3	82,3	73,4	58,6
Mango	65,4	73,3	73	72,4	83,9	83,3	71,9
Jack fruit	51,9	65	65,5	64,7	75,6	77,4	72,4
Oranges	12,8	18,8	21	19,1	44,5	40,5	15,2
Lemon	7,9	12,8	8,3	15,9	32,5	16,3	6,2
	263,6	**322,1**	**310,7**	**316,1**	**410,7**	**383,8**	**315,3**
	43,9	**53,7**	**51,8**	**52,7**	**68,5**	**64,0**	**52,6**
Caliandra	2	15	6	4	69	49	5
Leucaena	1	4	2	3	30	8	2
Moringa	4	27	7	4	57	25	10
Ficus	55	63	52	60	73	65	5
	62	**109**	**67**	**71**	**229**	**147**	**22**
	15,5	**27,25**	**16,75**	**17,75**	**57,25**	**36,75**	**5,5**
Seteria	0	6	4,4	3	34,6	25,4	4,3
Kikuyu	0,8	3	4,4	4,8	21	16,7	11,9
Napier	32	43,2	18,3	37,8	72,4	46,8	31
	32,8	**52,2**	**27,1**	**45,6**	**128**	**88,9**	**47,2**
	10,9	**17,4**	**9,0**	**15,2**	**42,7**	**29,6**	**15,7**
Lab lab	1,5	4,9	3,2	7,6	35,9	13,9	2,9
Velvet bean	1,9	4,1	0,4	3,2	30,9	0,4	1
Jack bean	5,3	8,3	0,4	3,7	28,8	3,6	1
	8,7	**17,3**	**4**	**14,5**	**95,6**	**17,9**	**4,9**
	2,9	**5,8**	**1,3**	**4,8**	**31,9**	**6,0**	**1,6**

Annex 12: **Relationship between coffee cultivation and pesticide use**

	Exp(B)	Wald	Sig.
Coffee cultivation	4.335	19.089	.000

Adjusted Nagelkerke R^2: .070; model Sig.: .000

Annex 13: **Socio-economic factors' impact Productivity** (all farmers)

	Beta Coefficient	t	Sig.
Number of crops	.085	1.931	.054
Agricultural labour units	.062	1.572	.116
Pesticides application	.052	1.359	.175
Education of head of HH	.045	1.174	.241
Sex of head of HH	.042	1.088	.277
Number of livestock	.038	.910	.363
Group marketing	-.014	-3.29	.742
Age of head of HH	-.037	-.931	.352
Land owned	-.046	-1.042	.298
Fertilizer application	-.173	-4.401	.000

Adjusted R^2: .042; model Sig.: 0.000

Annex 14: **Socio-economic factors' impact on Productivity** (SA farmers)

	Beta Coefficient	t	Sig.
Organic pest management bananas	.219	2.645	.009
Zero-grazing	.172	2.332	.021
Agroforestry	.079	1.102	.272
Fodder crops	.035	.475	.635
Manure	.021	.273	.785
Organic pest management other crops	-.006	-.074	.941
Mulching	-.090	-1.246	.241
Soil and water conservation	-.150	-2.184	.030
Compost	-.225	-3.135	.002

Adjusted R^2: .139; model Sig.: 0.000

Annex 15: **Off-farm income sources listed by interviewees**

	Reference	SA	Outgrowers
Average No.	**1.4**	**1.5**	**1.2**
Small businesses	52%	57%	43%
Remittances	37%	50%	45%
Formal employment	19%	19%	14%
Casual labour	23%	14%	12%
Others	8%	8%	6%

Annex 16: **Net income farming plus value of subsistence production** (in UGX)

	10P	25P	50P	75P	90P
Reference	335,290	946,875	2,300,250	3,981,900	6,364,145
SA	938,560	2,367,000	4,072,500	6,826,000	11,816,800
Outgrower	826,000	1,505,880	3,307,000	5,009,500	8,188,000
+SA/Ref	**180%**	**150%**	**77%**	**71%**	**86%**

Annex 17: **Self-assessment of income situation**

	Reference %	SA %	Outgrower %
Decrease	53.6	15.1	51.4
The same	13.9	2.0	8.6
Better	29.4	55.6	35.2
Much better	3.2	25.8	4.3
No answer	0.0	1.6	0.5

Annex 18: **Socio-economic factors' impact on Income** (SA farmers)

	Beta Coefficient	T	Sig.
Zero-grazing	.150	1.967	.050
Manure	.141	1.750	.081
Compost	.057	.769	.443
Organic pest management other crops	.049	.563	.574
Mulching	.042	.561	.576
Soil and water conservation	.031	.440	.660
Organic pest management bananas	.000	.003	.998
Agroforestry	-.002	-.023	.981
Fodder crops	-.183	-2.424	.016

Adjusted R^2: .079; model Sig.: .016

Annex 19: **Savings in bank account or in cash**

	10P	25P	50P	75P	90P
Reference	0	0	**10,000**	200,000	700,000
SA	0	60,000	**285,000**	955,000	2,970,000
Outgrower	0	0	**50,000**	250,000	700,000
+SA/Ref			**2750%**	378%	324%

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