



Social Learning on Sustainable Agricultural Intensification: Perspectives from three agricultural projects in Southern and Eastern Provinces of Zambia

Introduction

Zambia is experiencing increased demands on agriculture for food, fuel and other services. The factors driving this increased demand include a growing population and the development of local and urban markets, along with global and regional markets. Farmers, from smallholders to large scale commercial operations, are trying to respond to this increased demand on production, but average yields of main food crops remain low (Sitko and Chamberlin, 2015) and the alternative strategy, of increasing the acreage under production, is driving up deforestation rates. Zambia is also increasingly experiencing the effects of global warming and climate change.

The current agricultural systems in Zambia are unsustainable in social, economic and environmental terms. Agricultural and forest landscapes in Zambia are changing rapidly. Opening of new cropland is contributing substantially to recorded losses of approximately 275,000 ha of forests in the country every year (Chidumayo and Gumbo, 2012).

There is, therefore, an urgent need for action throughout the food system including in policy processes, investment, innovation and practice to influence supply and demand to make agriculture more sustainable. Sustainable Agricultural Intensification (SAI) offers a way to increase production using existing farmland while reducing or eliminating negative impacts on the environment and potentially improving peoples' livelihoods (Garnett et al., 2013; Haggard et al., 2017).

SAI has been defined as (i) producing more output from a given area of land while reducing the negative environmental impacts and increasing contributions to natural capital and the flow of environmental services (Pretty et al., 2011) or (ii) practices that aim at increasing food production in response to the demands of the growing population and reduce vulnerability to shocks and stresses, while conserving critical ecological services (Masumba et al., 2017). Zambia, through its agriculture, forestry and environment policies, has documented the need for interventions to support sustainable agriculture and protect the environment. For example, the Second Agricultural National Policy has clear objectives that support Sustainable Agriculture including promoting sustainable land management technologies, such as conservation agriculture and appropriate stock densities. In response, several agricultural practices, which are consistent with the SAI concept are being promoted widely in the country, including conservation agriculture (CA), agroforestry (AF), and integrated soil fertility management (ISFM).

The Sustainable Agricultural Intensification Research and Learning in Africa programme (SAIRLA) has facilitated learning around the experiences of farmers and other stakeholders participating in the implementation of agriculture projects promoting these practices. The aim of this discussion paper is to inform and stimulate debate around enabling SAI in Zambia.



Sustainable Agriculture projects in Zambia

The Government of Zambia, in collaboration with other organisations (private sector, CSO and NGOs), is promoting CA, AF, ISFM and other SAI related practices across the country through donor funded projects. SAIRLA, through a partnership between the Zambia National Learning Alliance (NLA) on SAI and the *Negotiating Ecosystem Service and Livelihood Trade-offs in SAI* research project led by World Forestry (ICRAF) has facilitated a process of learning through the experiences of the stakeholders with three of these projects (Box 1).

Box 1. Background to three SAI projects

Conservation Farming Unit – Climate Smart Agriculture Zambia (CFU – CSAZ)

The UKAID funded CFU-CSAZ project (2016-2021) has a budget of GBP 25 million covering 22 districts in two climatic zones of Zambia. The aim is to train 995 000 farmers (45% being women) in climate smart agriculture practices and have 188 600 new adopters and 157 600 sustained adopters of CA practices following the training. The main thrust of its work is hands-on extension training, using lead farmers in their own farming communities. The CFU achieves the geographical spread through a network of 6 regional offices, 100 dedicated field staff and a cohort of nearly 3,000 Lead Farmers.

Food and Agriculture Organization – Conservation Agriculture Scaling-Up (FAO – CASU)

The Conservation Agriculture Scaling-up (CASU) project (2013 – 2017) was implemented by the Food and Agriculture Organisation of the United Nations (FAO) in collaboration with the Government of Zambia. The €11 million programme was funded by the European Union via the 10th European Development Fund (EDF) targeting over 300 000 farmers in 48 districts in nine provinces across all agro-ecological zones of Zambia. The overall objective was to contribute to reduced hunger and improved food security, nutrition and income in Zambia, while promoting sustainable use of natural resources. The project's purpose was to increase crop productivity and production for the targeted farmers of which 40% were women.

Netherlands Development Organization – Sustainable Integrated Land Management Solutions (SNV – SILMS)

Sustainable Integrated Land Management Solutions (SILMS) is a Euro 4.4 million project funded by Sida, implemented in two districts (Katete and Lundazi) in Eastern Province. SILMS uses a market-based approach to increase incomes for smallholder farmers through adoption of the sustainable land management practices of Integrated Soil Fertility Management (ISFM), Agroforestry and Deforestation-free Supply Chains. The project is built around four objectives which address major constraints; lack of access to markets, finance, inputs and extension services.

A trade-off is a situational decision that involves diminishing or losing one quality, quantity or property of a set or design in return for gains in other aspects. Trade-off analysis has become an increasingly important approach for evaluating system level outcomes of agricultural production and for prioritising and targeting management interventions in multifunctional agricultural landscapes (Klapwijk et al., 2014).

We developed a participatory trade-off method to gather perspectives from different groups of stakeholders on the synergies and trade-offs of the farming practices being promoted by the three projects. We used the Sustainable Intensification Assessment Framework for this participatory trade-off analysis (Figure 1). It

presents five domains; productivity, economic, environment, human condition and social (Masumba et al., 2017). Within these five domains are indicators which are quantitative or qualitative factors or variables that provide a simple and reliable basis for assessing achievement, change or performance (see Appendix 1). Participatory Trade off Analysis of the approaches and practices promoted by the projects was done in groups (private sector; public sector; civil society organisations and non-governmental organisations, female and male farmers).

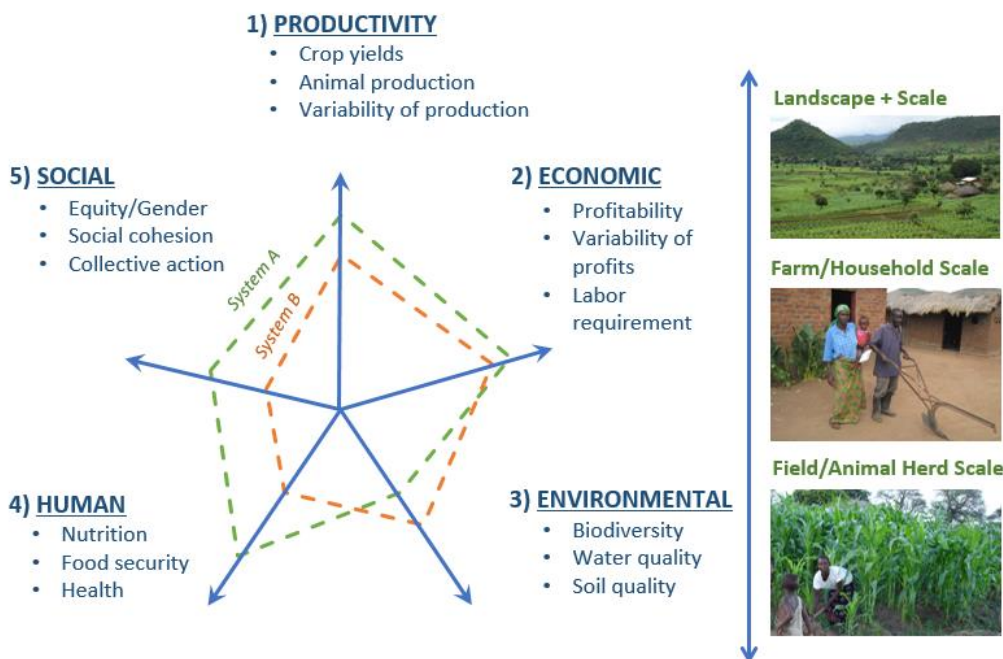


Figure 1: The Sustainable Intensification Assessment framework showing interlinkages across the five domains of sustainable intensification and cross spatial scales with examples of indicators for each domain

Emerging observations and discussion points around SAI domains

This section presents some stakeholder views and emerging observation and discussions points for each of the five SAI domains assessed.

Agricultural Productivity (1)

CFU: Some farmers are concerned about livestock and hence see increased crop residue as provision for livestock feed, while the NGO/CSO group saw achieving residue retention as a challenge, a key principle of CA. Government participants suggested that CA projects should also consider livestock. Some farmers also reported that CA provides good crop yields consistently irrespective of year to year weather variations

CASU: Participating farmers realised the importance of applying full principles of CA. The private sector echoed this when they noted that, for CA promotion to be successful, there is need for extension officer involvement

and more resources and funding. Government at provincial level said that the impact of CA was not high because CA components were incompletely adopted and CA principles were not consistently applied, for example ripping was more highly practiced than rotations. Government representatives at district level highlighted that CA can increase maize yields by about 40-60%, however lack of markets, especially for legumes, hinders crop diversification.

SILMS: Farmers believed that ISFM – AF can improve agricultural productivity, but reliable markets are needed. Livestock production is an important component of farmers' livelihoods and, although the project did not include a livestock component, farmers did use crop sales proceeds to buy livestock. It was also highlighted by the private sector that there is lack of crop residues for livestock grazing.

Emerging observations and discussion points (agricultural productivity)

- Most stakeholders interpret productivity in terms of maize productivity. Should there be greater emphasis on the productivity of the wider farming system, including crops and livestock?
- Farmers and other stakeholders raised the issue of trade-offs between crop residue being used to either increase crop productivity or being used for livestock feed. What is the role for livestock to play in agricultural systems?
- Access to legume seeds and markets for legume crops is a challenge. What are the roles and benefits of inclusion of legumes in the system in terms of productivity, human nutrition, income, and is there a role for livestock feed?
- All stakeholders scored the interventions highly in terms of crop productivity. But to what extent is adoption of these technologies translating into increasing productivity a) in the short term and b) in the longer term? Are statements about productivity increase based on use of external inputs e.g. chemical fertiliser or on use of CA principles/ techniques?
- All three projects had maize as a major component and in all three project areas there is a major food deficit in 2019. To what extent are the SAI interventions around maize -based systems being promoted able to maintain productivity in the face of climate change?

Economic/ Income (2)

CFU: Farmers highlight that income can be increased through increased production, however markets are a challenge (capacity to sell is a problem, markets are "terrible" resulting in low profitability, farmers are not involved in deciding on prices, poor access to market information). Government representatives emphasised that it is imperative for organisations promoting CA to provide market information and incentives for farmers. Although farmers highlight labour for CA as a challenge, the private sector is of the view that, although unpredictable due to changing weather patterns, the proper use of CA equipment, chemicals and principles reduces labour requirements and increase profits.

CASU: Farmers and private sector clearly and consistently highlight challenges with markets and market information, while government participants highlight that markets and information were available (although under the agricultural productivity domain they highlight that markets especially for legumes were a challenge). Government stakeholders also highlighted challenges with climate change, which might affect production consistency. NGOs suggest CA is highly profitable because of reduced input costs and optimal utilisation of inputs. District government staff reported that demand for labour is reduced, use of inorganic fertilisers reduces and there is efficient use of resources, but climate change has contributed to the low income.

SILMS: Income is not well realised because market development in rural areas is still a challenge. Prices are not stable, there are delays in announcing commodity prices and market information is not accessible - as highlighted by farmers, NGOs and private sector. However, government participants were of the view that the project has helped in improving farmers' income base through promotion of agriculture diversification (legumes: soya beans, common beans, groundnuts, cereals: maize, and cash crop: cotton). Female farmers, who are generally responsible for weeding, highlighted that CA is labour intensive if using the basin method, there will be too many weeds and area covered per day is very small.

Emerging observations and discussion points (economic/income)

- Are statements about profitability based on use of external inputs or on use of CA techniques?
- Increased productivity does not translate into increased income due to market issues: Availability and access to markets; lack of market information.
- Government stakeholders commented on the lack of financial incentives for CA farmers to engage in sustainable agriculture. Should there be premium prices for crops produced under CA and who will be responsible for paying the premiums?

Environment / Land Health (3)

CFU: Land health generally improves with CA, however there is need for training on proper use of herbicides and pesticides. This can assist in conserving water quality as highlighted by farmers and the private sector. The NGOs highlighted that fuel wood is a challenge as few farmers are planting trees, however government participants said that those who plant fast growing species like Gliricidia can have both wood and leaf biomass for soil fertility.

CASU: Farmers say that CA promotes land health if instructions are followed but when herbicides are used there is an aspect of killing the insects that protect the crops. Negative effects of herbicides on water quality was also highlighted by the private sector, while government participants also say that herbicides do not encourage growth of natural vegetation.

SILMS: The NGOs, who are the main promoters of CA, highlight that benefits from improved soil health take time to realise, as do benefits from trees as they take 3 – 5 years to grow. As much as trees will be beneficial in the long term, female farmers say that it is difficult to access tree seedlings and the right type of trees.

Emerging observations and discussion points (Land health)

- A key point is the incompatibility between short term nature of projects and longer timescales required to improve soil health: farmers don't have the opportunity to experience longer term benefits during the life of a typical agricultural project.
- Most farmers are assessing success according to short term benefits e.g. use of fertiliser to achieve immediate maize yields, rather than more complex interactions which can take time to produce visible benefits
- There are trade-offs between a) perceived negative environmental effects of herbicides (such as reduced water quality) and labour saving and b) perceived negative environmental effects of herbicides and crop diversification (e.g. pumpkins in maize fields).



Human condition– nutrition, food security and health (4)

CFU: All stakeholders agreed that increased crop productivity and crop diversity, as promoted by crop rotations improves nutrition and the related additional income assists in sending children to school and the general wellbeing of the household.

CASU: All stakeholders highlighted that improved crop productivity and diversity ensures that families are food and nutrition secure all year round. Increased income assists parents to afford sending more children to school and children are also healthier. However male farmers insist that chemicals that are sprayed can have negative health impacts on people in the surroundings.

SILMS: Only male farmers and government participants had comments under the human condition domain. Government participants highlighted that production of the three value chains (soya beans, groundnuts and common beans) has helped in promoting nutrition amongst farmers. Food security has improved, and they are able to send more children to school. Male farmers highlight that it is important to have CA training available to all social groups and that it should be an aim for youths to participate.

Emerging observations and discussion points (Human condition)

- Stakeholders generally rated CA highly in terms of improving human nutrition through increasing maize production and inclusion of legumes in the system. To what extent and under what circumstances do these agricultural interventions improve nutrition?
- Limited diversity of the legume basket being made available to farmers. Is there a case for a more systemic approach to achieving SAI?

Social – equity / gender, social cohesion, collective action (5)

CFU: There was a high level of consensus among stakeholders that youth participation, in particular in the case of males, is very low. Reasons for this were that CA can be difficult if one does not have the required implements and also that benefits take longer to emerge while youths want quick fixes. Women participate more, however CA is not very inclusive as physically challenged people find it difficult hence the need for tailoring technologies. Access to credit is conditional on access to collateral, while access to market information is a challenge.

CASU: Low access to credit facilities was highlighted as a challenge by all stakeholders, with the reasons being that most financial institutes require collateral and also that farmer education on loan management is still very low. Participation of youth was also highlighted as a challenge: there is need for incentives to encourage them to be involved in agricultural activities

SILMS: Low participation of youths and marginalised groups was also highlighted by stakeholders. The NGO group stated that the project only focuses on gender and does not consider other disadvantaged social groups such as the disabled. Male farmers say that agriculture is an important economic driver hence the government must consider that. Government participants went on to say that to improve farming there should be forums that include government, NGOs, farmers and other stakeholders.

Emerging observations and discussion points (Social)

- Limited participation of different disadvantaged or excluded social groups was raised as an issue by different stakeholders; interventions tend to focus on gender with insufficient attention given to diverse social groups, including youth.
- Farmers and other stakeholders reported limited access to finance or credit for external inputs, production equipment and processing equipment.

Examples of SAI Trade offs

Table 1 below provides examples of SAI trade-offs identified by farmers and other stakeholders participating in the three projects.

Table 1: Examples of Farmers' and other stakeholders' perspectives on Trade-offs of SAI approaches and technologies

Technology	Benefits	Negative	Trade offs
Use of herbicides vs hand weeding	Reduce labour burden especially for women, also time gained can be used for other activities for increasing household income	Farmers say that most of them do not have anything to do especially during the rainy season, hence too much time and this leads to laziness. Herbicides if not properly used can also affect the environment No crop diversification	Diversification in terms of being able to grow many crops in field v economic saving of reducing labour Environment cost of water pollution, loss of biodiversity v economic saving of reducing labour
Use of ripper v conventional plough	More land can be cultivated (e.g. convert more land under conventional practice to CA), crop yields (grain and residues increased), income also can be increased	Too many weeds when using ripper hence need for herbicides Soil disturbance is high with conventional plough leading to land degradation	Environment cost of water pollution, loss of biodiversity v environment cost of land degradation
Crop residues and livestock	Dry season feed, improved livestock production	Needed for soil cover (mulch)	Cost of soil health (organic fertilizer) v benefits from livestock services and products

Technology	Benefits	Negative	Trade offs
			Cost of soil health (organic fertilizer) v cost of livestock feed
Rotations	Soil health improved, as well as household nutrition and income	Not able to plant legumes on larger areas due to market challenges	Cost of soil health (organic fertilizer) v income loss due to lack of markets

Barriers hindering stakeholders from addressing the trade-offs and investments needed to effect change

Participants were asked to discuss the results from the trade-off assessment and identify which one of the five domains will need the most attention to reduce negative impacts. Within the selected domain, stakeholders identified indicators where there was a need to make a change to reduce the negative impact and highlighted what investments were needed to effect that change (Table 2 overleaf).

CFU: Farmers and government highlighted indicators under the social and income domains that needed attention including access to credit, capacity to sell agricultural products and participation of youth. Investments required include provision of soft loans, capacity building through on-farm demonstrations, creation of youth groups and the use of approaches such as social activities to promote agriculture. The private sector and NGOs highlighted indicators under the crop productivity domain, where areas for attention are plant residue and crop productivity. Private sector representatives said that contract farming is an approach that can be used to increase productivity as markets will be assured and that it is important not to only focus on NPK rich fertilizers, but to also consider liming as most soils are acidic.

CASU: Both the private sector and NGOs highlighted indicators under the social domain; participation of different social groups and access to information. They suggest that more sensitisation of the different social groups on the need to participate, together with the provision of information, could assist in effecting change. The farmers say access to markets and input intensity are some of the barriers under the income domain. They suggest that forming groups or cooperatives, value addition, knowledge sharing and training could assist on the market issues. On inputs they say that increased use of organic fertilisers would be helpful: suggested sources include livestock manure, fertiliser tree biomass and use of crop residues. The government participants highlighted issues under the land health domains (vegetative cover, plant biodiversity and fuel security) and income (labour requirements, input intensity and consistency from each cropping season). Investments that are needed to effect change include; sensitisation on benefits of using organic inputs, developing irrigation infrastructure and sensitisation on weather index insurance.

SILMS: Three groups of stakeholders (farmers, private sector and government) highlighted indicators that need attention under the social domain while the NGOs highlighted indicators under the land health domain. Participation of different social groups, access to credit and government institutions were mentioned under the social domain. Investments needed, as suggested by farmers, include improved road networks, increased number of camp officers, NGOs to provide credit, training and equipment to farmers. The private sector mentioned that government should improve markets, buy produce in time, provide reasonable prices and NGOs



should provide credit, training to farmers and make sure they follow instructions as per technology requirements. The private sector also said that there must be cooperation amongst farmers. The government highlighted the importance of sensitisation, creation of youth empowerment programs and involvement of more youths in different agriculture programs. The NGOs highlighted concern on fuel security and water quality under the land health domain. Investments needed to effect change include sensitisation on alternative fuel sources, (wood lots, biogas, efficient cooking stoves), sustainable cutting of trees and promotion of biological controls and crop diversity.

Concluding comment

This discussion paper was shared and discussed in a national learning symposium event in Lusaka in November 2019 organised by the Zambia NLA. Reports on the participatory trade-offs workshops that the NLA conducted with the CASU, CFU and SILMS projects are available on the SAIRLA website at <https://sairla-africa.org/>

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Table 2 Barriers hindering stakeholders from addressing the trade-offs and investments needed to effect change

Projects		Male Farmers	CSO/NGOs	Private	Govt
CFU	Domain and indicator that needs most attention	-Social - Access to credit and participation of the youth -Income – Capacity to sell agricultural products	Agricultural productivity – Plant residue productivity	Agricultural productivity – crop productivity	Social – Participation of the youth and the marginalised
	Investments needed	Inviting youths to participate in lessons of farming Creation of groups Use social attractive approaches e.g. football games Calling all people to be taking part during field days Provide soft loans for processing machines	Sensitisation Budget flexibility	Selling of agricultural lime and organic manure Contract farming	Introducing or intensifying CA interest groups Continue capacity building through demonstration by both state and non-state actors designing user friendly technologies Support CA programs by all stake holders to enable marginalised groups easily participate
CASU	Domain and indicator that needs most attention	Income – Access to market information and input use intensity	Social - low participation of the marginalized groups	Social – Access to information and more participation	Land health – Vegetative cover, plant biodiversity and fuel security Income – Labour requirement, input intensity and consistency from each cropping season
	Investments needed	Forming groups & cooperatives knowledge & training Keeping of livestock for manure Planting of trees for manure Keeping of crop residues Value addition	more sensitization on the need for participation	More sensitization and access to information	Vegetative cover, fuel security and plant biodiversity Sensitization on benefits of using organic inputs Investment in irrigation infrastructure Sensitisation in weather index insurance



Projects		Male Farmers	CSO/NGOs	Private	Govt
SILMS	Domain and indicator that needs most attention	Social – Access to Govt institutions, participation of different social groups and access to credit	Land health – Fuel security and water quality	Social – Access to credit, participation of youth and access to information	Social - Participation of the youth And different social groups
	Investments needed	<p>Improve road network</p> <p>Improve the number of camp officers</p> <p>Market start early (in good time)</p> <p>NGOs should give credit to farmers</p> <p>NGOs should supply inputs and equipment to the farmers</p> <p>NGOs should give enough trainings to farmers</p>	<p>more sensitization on alternative fuel sources</p> <p>Wood lots, sustainable cutting of trees, provide biogas, Supermoto</p> <p>Insect biodiversity, promotion of biological control, promotion of crop diversity</p>	<p>Government should improve markets</p> <p>Government should buy produce in time</p> <p>Government should provide reasonable prices</p> <p>NGOs should provide credit inputs to farmers/ to provide trainings</p> <p>Farmers should follow the training rules to apply to their fields+ cooperation among farmers</p>	<p>Sensitisation on youth participation</p> <p>Creation of youth empowerment programs</p> <p>More youth to be involved in youth program participation</p>





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Appendix 1: SAI domains and indicators

Agricultural Productivity

- crop productivity
- plant residue productivity
- livestock productivity
- consistent production over time
- crop diversity
- capacity to produce surplus for the market

Economic/ Income

- profitability
- consistent profit from each cropping season
- income diversification
- input use intensity
- labour requirement
- capacity to sell agriculture products
- access to market information

Environment/ Land Health

- vegetative cover
- plant biodiversity
- fuel security
- insect biodiversity
- water availability
- water quality
- soil health

Human Condition

- nutrition
- food security
- human health
- access to education

Social

- participation of the youth
- participation of woman
- participation of marginalized groups
- participation in farmer groups/women's groups/youth groups
- access to credit
- access to government institutions
- access to information