

SMALLHOLDER LIVELIHOODS

ETH SUSTAINABILITY SUMMER SCHOOL 2012



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Abstract

The group of students was given the task of critically engaging with the proposed Southern Agricultural Growth Corridor of Tanzania (SAGCOT) programme. This Public-Private Partnership, developed at the 2010 World Economic Forum, encourages the flow of investments to develop agriculture in Tanzania. The Tanzanian landscape has fertile soils, available fresh water resources and a large amount of arable land. Despite this, the country is faced with significant limitations to expand the agricultural sector. Smallholder farming of 2 hectares or less is the predominant farming practice throughout the country.

The task required students to design a hub and outgrower model, or a suitable alternative, as well as suggestions on how Syngenta can best engage with the project. Syngenta AG is a Swiss agriculture company, specializing in crop protection techniques and seeds. The company's stated aim is to increase its profits whilst simultaneously contributing to improved food security. Syngenta is one of the private firms involved in the SAGCOT programme.

The complex nature of the SAGCOT initiative and the diversity of opinions within the student group led to the creation of two different proposals to improve

smallholder livelihoods in Tanzania.

Model A is close to the original SAGCOT plan, in which international private companies have a role to play through the implantation of strategic commercial farms that guarantee the installation of infrastructures, input supplies, etc. The voice of smallholders is represented in a specific facility, the so-called community centre. In this model, a quick economic and social growth can be achieved, while given mechanisms are used to preserve the environment and endemic culture.

Model B disregarded the underlying values embedded in the SAGCOT plan, and takes a completely different approach to developing the agricultural sector. The focus of this model is not the generation of profit from immediate economic growth, but rather a focus on long-term environmental resilience and market independence development in Tanzania. Agroecology and farmer-to-farmer teaching methodologies frame the approach to the model.

Both models present different alternatives to the common goal of improving smallholder livelihoods in Tanzania.

Acknowledgements

There are a number of people that we would like to thank for their help and contribution to this work.

Syngenta, especially Kavita Prakash-Mani and Ellen Jobling, Biovision, especially Samuel Ledermann, Helvetas, especially Martin Dietz, the NADEL, especially Jutta Werner, the Agri-food & Agri-environmental Economics Group (AFEE), especially Martijn Sonneveld, the World Food System Center, especially Michelle Grant as well as Juanita Schläpfer for the communication training.

INTRODUCTION

THE SAGCOT INITIATIVE

General Introduction

By 2050, the world population is expected to reach 9 billion people. About 2 billion people are still living today below the poverty line and in low food security, in spite of a sufficient world food production. It will be a real challenge in the coming years to lift out of poverty and guarantee food security for these people, while also feeding the rapidly growing entire world population, in a financially and environmentally sustainable way.

Tanzania is seen by some as a promising candidate to develop in order to boost regional and global food security. Some claim that today, a large part of its high-quality arable land remains unused or underused. Tanzania possesses one of the biggest livestock herds in Africa and a priceless biodiversity heritage within its wide protected areas. However, smallholder farmers often have little or no access to markets, modern agricultural techniques, proper storage facilities, which results in low yields and high post-harvest losses.

In 2010, The Southern Agricultural Growth Corridor Of Tanzania (SAGCOT) initiative was announced in Dar es Salaam, to promote a large-scale agricultural development around the pre-existing southern infrastructural backbone by 2030, based on Public-Private Partnerships (PPP). In this

project, which involves 20 different stakeholders, private multinational companies (one of them is Syngenta) intend to invest 2.1 billion dollars over 20 years. Public authorities will loan 1.3 billion dollars over the same period, in improvement of infrastructure and development of clusters.

Our tasks were to investigate sustainable models for the SAGCOT initiative, as well as to consider how Syngenta, as one of the private sector stakeholders, can best engage in these models.

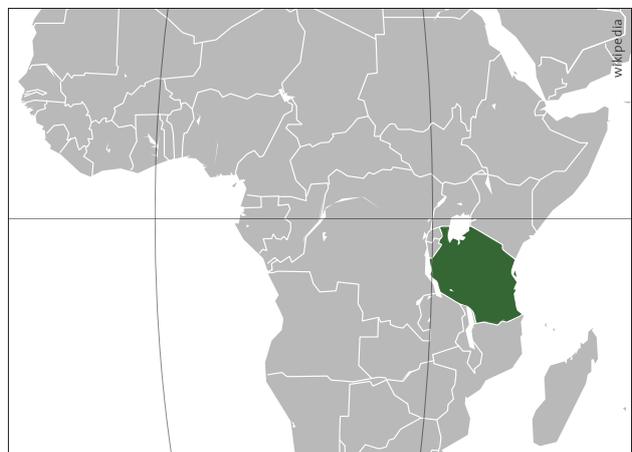


Figure 1: Tanzania.

Agriculture in Tanzania as described by the SAGCOT Blueprint

Tanzania’s economy relies mainly on agriculture. « Over 80% of the population live in rural area and agriculture is their main source of livelihood » [1]. A majority of farmers have limited access to markets and still lack basic tools, infrastructure and improved farming techniques. In consequence, almost the whole rural population remains poor and vulnerable to drought, floods and other risks. In addition, yields are usually low (around 1.5 tons per hectares for example for maize [1]).

However the country has a lot of opportunities for agricultural development. In fact, only 24% of the arable land in the country is being utilized and in the corridor, 95% of the 2.1 million hectares that are under production are farmed by smallholders using traditional methods [1]. In particular, Tanzania’s southern corridor has the potential to become a globally important producer of crops and livestock, as it benefits from good ‘backbone’ infrastructure – including road, rail and power – and passes through some of the richest farmland in Africa. Thus, improved access to finance, infrastructure, modern farming inputs and know-how would allow Tanzania’s smallholder farmers to achieve higher yields and sell into regional and international markets.



Figure 2, 3: Smallholders in Tanzania.

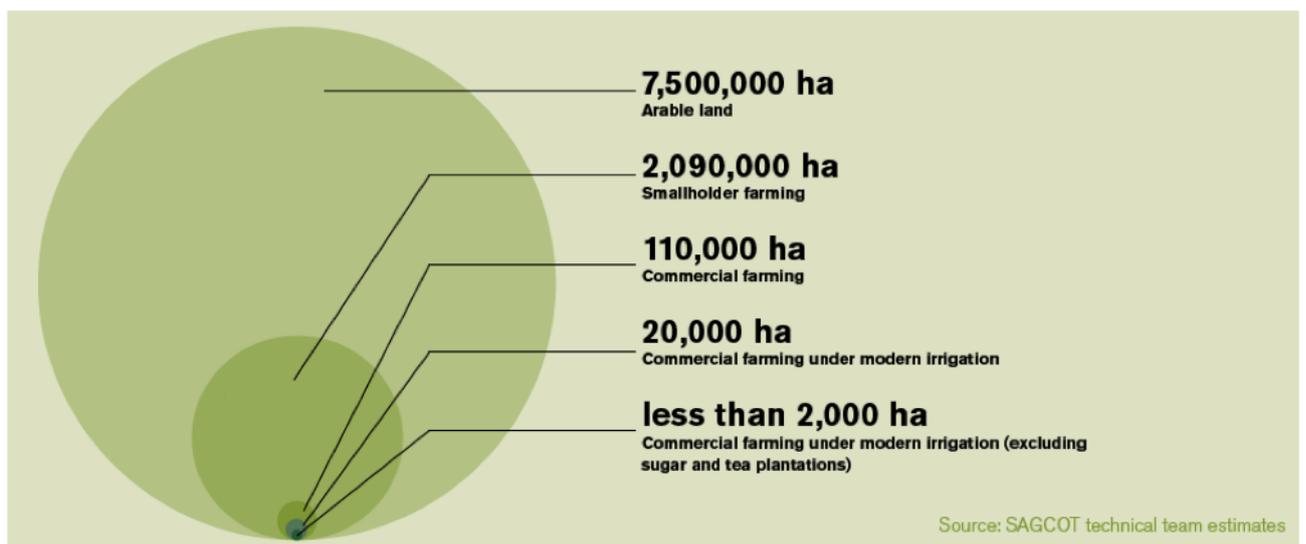


Figure 4: Key Agriculture figures in Tanzania.

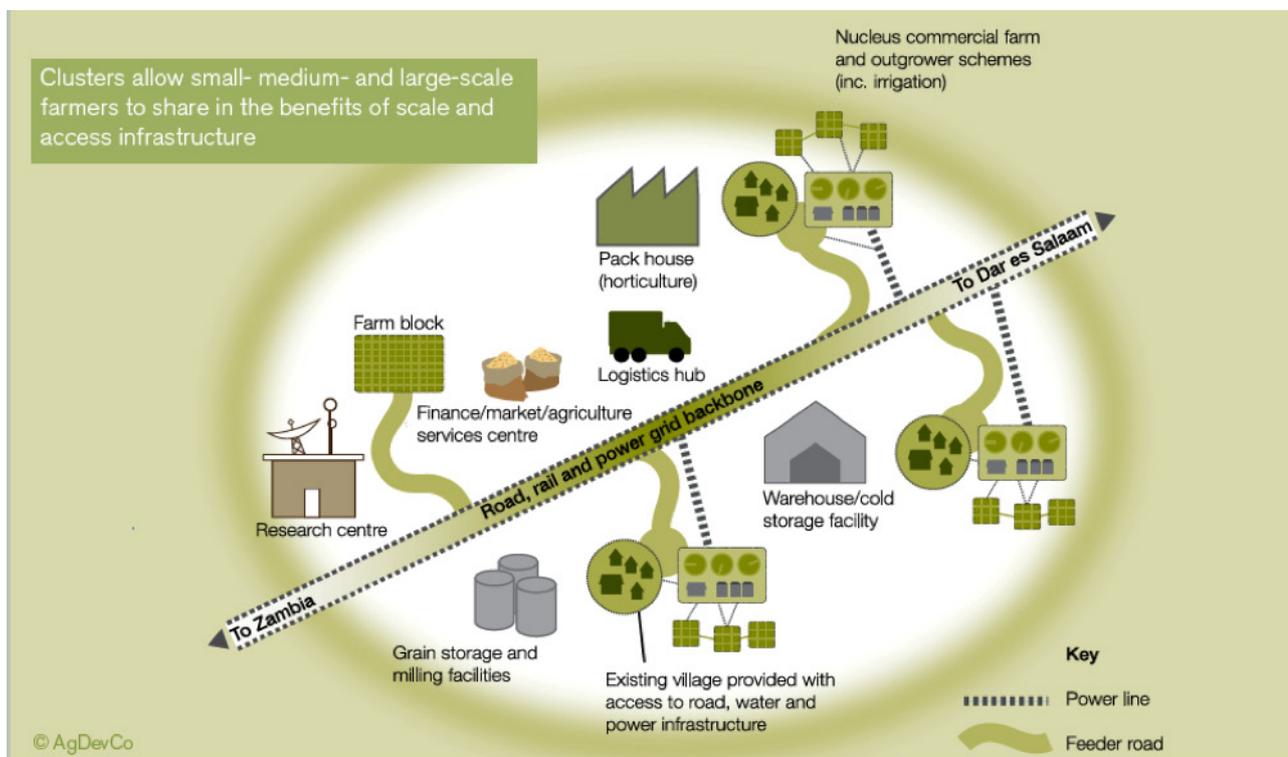


Figure 5: The SAGCOT Initiative.

The SAGCOT Initiative

The Southern Agricultural Growth Corridor of Tanzania (SAGCOT) initiative was born at the World Economic Forum on Africa held in May 2010 in Dar es Salaam (Tanzania). By catalysing large volumes of responsible private investment, the initiative aims to bring rapid and sustainable agricultural growth, with major benefits for food security, poverty reduction and reduce vulnerability to climate change.

The SAGCOT initiative is a public private partnership (including development partners) in which stakeholders work together and aim to achieve shared goals. It includes representatives of the government, global business (including Syngenta), the Tanzanian private sector, farmers, foundations and donor institutions. It is led by an Executive Committee co-chaired by the Minister of Agriculture of Tanzania; and the Executive Vice President (North and Central Africa) of Unilever.

The public-private partnership initial focus of the Executive Committee has been to prepare an Investment Blueprint for development of the SAGCOT initiative. In total \$2.1 billion from the private sector and \$1.3 billion from public sector grants and loans will be catalysed over a twenty-year period.

The project aims to promote the development of ‘clusters’ of farming agribusinesses along the corridor. The clusters will allow to bring together research stations, suppliers of farm inputs, machinery, and agriculture support services (extension agents, financial services), commercial farmers (large and small), processors and providers of infrastructure such as irrigation and rural roads. Thanks to these facilitated connections with commercial agribusinesses, smallholders in the vicinity of the commercial farms will be able to access inputs, extension services, value-adding facilities and markets.

SAGCOT's vision of the Southern Corridor by 2030

- 350,000 hectares in profitable production, serving regional and international markets;
- Tens of thousands of smallholders become commercial farmers, with access to irrigation and
- weather insurance;
- Annual value of farming revenues \$1.2 billion;
- At least 420,000 new employment opportunities created in the agricultural value chain;
- More than two million people permanently lifted out of poverty;
- Regional food security would be assured [1].



Figure 6: Smallholder in Tanzania.



THE CASE STUDY

OUR PROCESS

The Task and our Response

„Based on the concepts presented in the SAGCOT investment blueprint and with the goal of optimizing smallholder livelihoods:

- 1. Consider the questions: Why are smallholders commercialization systems not functioning at the moment? What are the blockades?*
- 2. Devise a sustainable market model for a ‘hub and out-grower’ scheme (or a concrete alternative).*
- 3. Define how Syngenta can best engage with and support the model. How can this bring commercial value for the business? Which other partners will be needed and what role would they play?*

The model will need to take into account the various challenges that smallholders face, including but not limited to:

- Lack of access to modern technology*
- Limited access to new agricultural knowledge and innovations*
- Lack of access to appropriate finance products*
- Lack of access to profitable markets*
- Lack of access to information*
- Poor infrastructure*
- Poverty and food insecurity*

In addressing these challenges, the model should:

- Improve smallholder livelihoods*
- Support and contribute to the local economy and rural development*
- Encourage resource efficiency and environmental sustainability*
- Create sustainable commercial value for the public and private partners*
- Reduce vulnerability to social, political, economic and environmental shocks*
- Consider gender issues in agriculture and rural development*

And by meeting these requirements, improve food security in the region and beyond.“

As can be seen in the survey results on page 14, opinions on the proposed task and on the SAGCOT initiative varied significantly. The group therefore divided as is described on page 13. The result was that two alternative answers to our task were created. For practical purposes and for better understanding, these models have been named Model A & Model B respectively. Model A explores ways to improve small farmers livelihood through the SAGCOT model. Model B is taking a critical approach and sets a focus on alternative models of farming.

The Process of making our Models

Our process in the case study reveals the complexity of the questions addressed and the controversy that they generate in society.

After the case study framework has been exposed to us, we made a first table round to express our opinions on the subject. From that early point, it was already clear that group members had very divergent and strong positions, even down to the legitimacy of the tasks. On the one hand, some among us started by questioning the soundness of engaging powerful and profit oriented private companies into the whole Tanzanian development plan. They feared that smallholders would be simply exploited and cheated by these players, resulting in another massive environmental and social catastrophe. On the other hand, some of us acknowledged the benefit of an ambitious investment initiative, but were more concerned about the actual deployment of the plan and its grassroots reality. On a big paper chart, we summarized the many concerns expressed during this first introduction to the tasks. A need for a stronger analysis of the present situation in Tanzania and the SAGCOT plan appeared to be needed.

During the first three days of work, the group went into a deeper analysis of the problems faced by smallholders in Tanzania. We drew schematics to help us conceptualize the farmers' difficulties. We identified key points for which we still needed additional information. Starting from that, we shared topics between ourselves to search the missing information.

After sharing this new information, our overview was sufficient to start building tentative models. We worked about two hours in smaller groups of two to four persons to initiate this process, by focusing on different areas of sustainability: socio-politics, economics, environmental aspects. When sharing the outcomes of our groups, it became more and more obvious that it would be very difficult to reach a compromised model that would satisfy all of our viewpoints. In particular, the necessity for our model to include a commercial farm appeared to be a very controversial point. Some argued that this feature was too close to the initially proposed SAGCOT plan, which should be rejected as unfair, while others argued that a commercial farm guaranteed private investments.

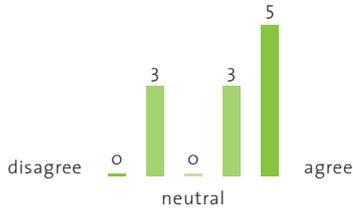
On Wednesday, we visited the chocolate factory of Chocolats Halba, which gave us a better understanding of possible interactions between business and smallholders. On Thursday evening in the first week of case study, we decided to set up an internal survey in our group on critical questions. The survey was done by Matthew on a custom survey website named Survey Monkey (www.surveymonkey.com). Together, we designed the nine most controversial questions that were causing divisions in the group. The responses to the questions were anonymous, with five different levels: strongly agree, partially agree, neutral, partially disagree and strongly disagree. The results, presented on the previous page, showed a strong polarization of the group on some fundamental questions, which had previously prevented us from reaching a consensus, although most group members were ready to compromise. After looking at the results of the survey, we decided to split into two groups and develop two models in parallel for several days. The first group (Group A) was composed of Moritz, Matthew, Deborah, Burjis, Isabelle and Charlotte. The second group (Group B) was composed of Federico, Milja, Mathias, Silva and Zeno. Charlotte also volunteered to harmonize the presentation framework for the two groups.

On Friday, we visited the Helvetas headquarters. The talk by Martin Dietz about how to make markets work for the poor was very inspiring for both groups. Each group could then develop their model for one day. On Monday afternoon, we had a meeting with our supervisors to expose the two models at their state of advancement. Our supervisors gave us feedback to help us progress on our tracks.

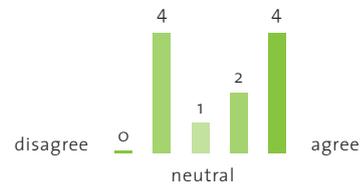
After two more days work in groups, with meeting for communication training, we started to set up our presentation, using an online software called Prezi. The presentation includes an introductory part, followed by two separate presentations of our models and a global conclusion.

Results of the Survey that made us separate in two Groups

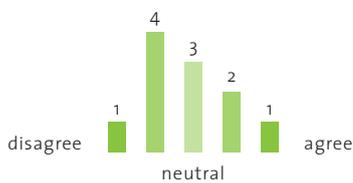
1. Do the farmers begin the decision making process in our model?



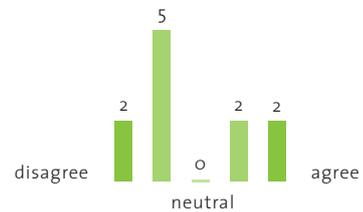
6. Our model should ensure that small scale farmers have complete ownership within 20 years.



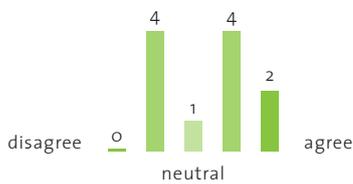
2. Commercial farms must be included in our model for it to be successful.



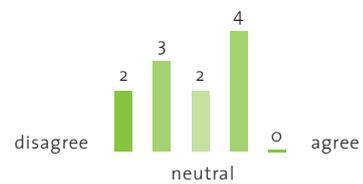
7. For this exercise it is important that our model is acceptable for Syngenta.



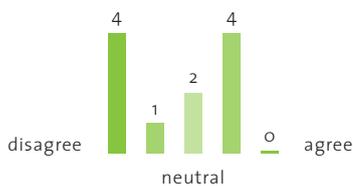
3. The farmers should have increased access to commercial fertilizers.



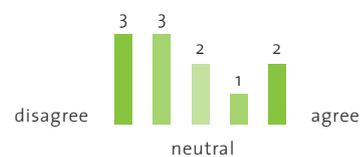
8. Our model is sustainable without private funds.



4. The use of artificial fertilizer is more effective (increased welfare) than agro-ecological methods.



9. Short term economic growth (3-5 years) is a higher priority than environment sustainability (50-100 years).



5. Large scale agri-business creates a net positive welfare for farmers (small).

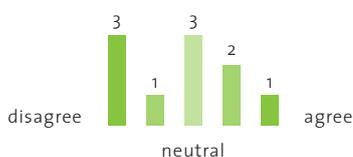




Figure 7: Discussing the models at ETH Hnggerberg.



MODEL A

THE HUB AND COMMUNITY CENTRE MODEL

The figure on page 17 shows a visualization of the hub in our proposed model. In this hub, the main stakeholders are as follows: local smallholder farmers, local government officials, private investors, and non-governmental organization representatives.

The hub will cover an area of 25km in radius, and will hopefully serve a rural population of 30,000 to 50,000 people, most of whom will be smallholders. Because of the presence of a commercial farm in the hub, smallholders in the hub's vicinity will be able to benefit from the economies of scale, which accrue to them as a result of the commercial farm's scale. These economies of scale include the presence of input providers, microfinance and microinsurance institutes, storage and processing facilities, irrigation, among many other things.

Importantly, our version of the hub goes further than the SAGCOT initiative's in defining how institutions will prioritize the smallholders and allow them to directly benefit from these developments instead of being victimized or further exploited by large corporations or local elites. The following describes a few key features of our hub.

This model is proposed by Burjis Godrej, Deborah Cheong, Isabelle Martiel, Matthew Hatson and Moritz Hofstetter.

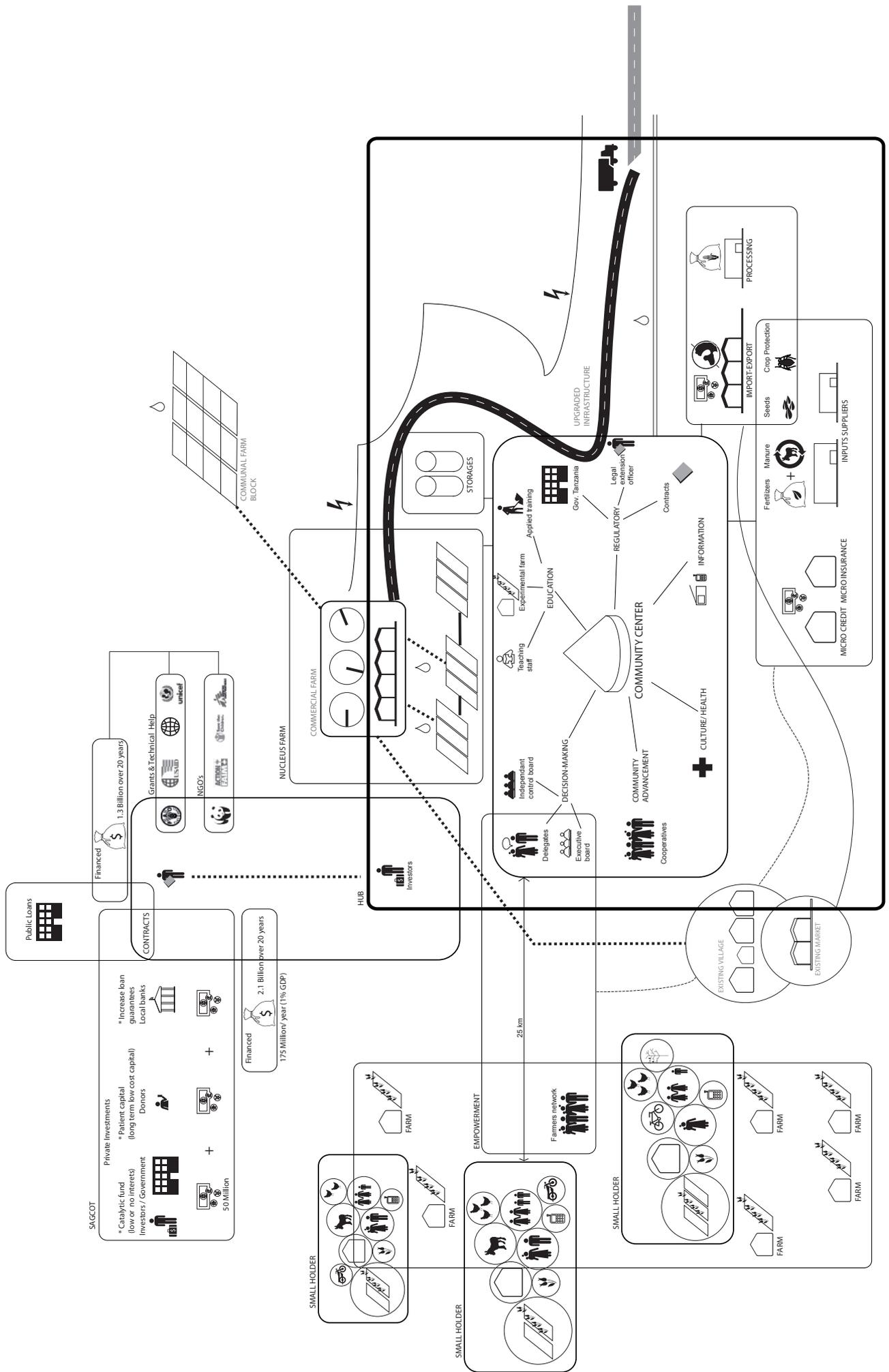


Figure 8: The Hub and Community Centre Model.

The Community Center

This centre (physically, technically and symbolically) is the proverbial “town hall” of our hub and will enable the operating bodies—most notably the small holder farmer’s network (or our so called “kilimo mtandao”)—to ensure that the massive increase in production will be equitably dispersed to the most vulnerable group – the subsistence farming family.

In basic terms, we envision this centre beginning as a simple roof with benches enabling groups to congregate in a well known central location. As each hub grows, so will the Community Centre, ensuring that local values are maintained and allowing each individual network to self determine their priorities and to gradually gain majority ownership in all operating firms in the region.

So while our Community Centre may begin as a simple meeting place, our model provides incentives to all stakeholders in the scheme for the structure to eventually become a bustling centre of activity. From an informal meeting centre where farmers, traders and government officials alike can exchange information and knowledge, to a veritable seat of the governing body of our farmer network, our community centre has no boundaries. Innovation and sustainability will be the centrepieces of our model and we imagine that as our intervention period blossoms that we can add permanent staff as education, legal and logistic experts. We also see a fully developed community centre containing an experimental farm—specific to the regional environment and crops that promotes a mix of traditional farming techniques with the application of feasible modern technologies. Another goal would be a type of East African Fair Trade or Fair Price structure again allowing for each farmer to be given maximum choice in their decision making and enabling them to fully develop their potential and to transform them from on-the-verge subsistence farmers in to healthy active members of the community.

Decision Making

Given some average numbers from the planned private-public partnership, we propose to form a type of farmer alliance that is self-governed and represents the proposed 7,000 households that will form part of each hub. This body will have low overhead and will simply consist of

representatives from each region (for example one representative per 175 households resulting in 400 delegates). From these 400 locally elected delegates, we propose that both an executive and control board be elected with maximum terms of three years. The measures will ideally reduce potential for abusive behaviour while promoting participation by all households who chose to become members. And instead of foreign companies or individuals imposing our structures on each farmer alliance, we will only empower them to self-determine their own priorities. So while each alliance will begin with a simple set of internal regulations and a clear division of power – the executive branch could, for example, decide of revenue sharing schemes, out-grower commercially advanced plot sharing, or extended infrastructure development.

Regulation

This area of the community centre allows us to provide the majority of our innovation and equity. We propose that a framework for contract (between stakeholders and between each and every private company joining the hub or establishing in the area) be elaborated prior to the initial establishment of any foreign company or public funding entity enter our proposal. This way, for example, any commercial farm would need to employ 90%+ local workers with a proportion in technical fields (ensuring local training). Also, a binding contract based on the size of the private firm could ensure that this is a pro-competition, pro-local business environment, further ensuring that a proportion of the benefits of this initiative reach those that have the least economic resources. An example of this would be that each input distributor that buys and constructs a distribution centre (ensuring their own land rights) would have to buy the land rights to a similarly valued land plot for the use and outright ownership of the farmers alliance. This would allow local competition to establish themselves in close proximity to the larger private foreign firms, and so would ensure that the farmers maximize their choice and that local business is not stifled by technically advanced foreign firms. All of our solutions are based on regulation decided under the “umbrella” of the farmer alliance so that all decisions, changes to existing legislation and in line with local laws are followed with all stakeholders’ interest being considered.



Figure 8: Group A discussing their Model.

Education

We have a number of proposals to ensure applied and relevant education and information to the out-growers in our model. Again, a certain level of local employment must be imposed on outside firms that would ensure that the knowledge of complex systems unfamiliar to the smallholders would be passed through on the job training. If the firms cannot find the appropriate labour in the area, then they would need to “train-up” regional labour force (particularly in the dry season when rain-fed farming activities are at their lowest). We believe in the theory that “if they build it, they can fix it” and so rather than re-do the mistakes of many past aid initiatives that built complex infrastructure only to see it fall in to disrepair when their intervention period ended, we would have a body of knowledge that could fix and maintain new infrastructure. In successful hubs, the workers who originally were trained as, for example, a water irrigation system, would be able to receive a fair wage from the farmers alliance if the private business decides to leave. Also, work schemes that employ farmers during the dry season or on a rotational basis, for example, on the

commercial farm, would work-to-train local farmers in modern techniques. Our plan admits that there will not be 100% diffusion of knowledge but spending three or six months on a commercial farm that has shown to produce high yield would ensure that many of the successful methods of large scale farming do return to the small holder when they return to their own plot. Another initiative in the mid term future would be—with increased tax revenues and increased incomes for all smallholders—to subsidize a small scale technical college in many of the hubs. There are many ways to incentivize both the providers and the student-farmers to participate in such schemes and since the overhead on such projects are so small, this information could be a sustainable body of knowledge that is passed horizontally among farmers and vertically between generations.

In short, our community centre is the key point of our innovative and optimized hub and out-grower model and would ensure that the four pillars of sustainability are emphasized for all stakeholders with a particular focus on those most in need or most vulnerable.

The Role of Private Companies

You might ask why the private sector would be interested in investing in this system? Despite the fact that initial investments will be high, firms will see a substantial return on investment in the mid to long term, as the companies involved are well aware. While these private firms will remain profit maximizing entities, their interests are connected to the sustainable success of the smallholder. The opportunities for private sector investment are as follows:

1. Infrastructure Investment

The southern corridor of Tanzania has the potential for large-scale increased agricultural production, but it lacks sufficient infrastructure in many areas. Currently infrastructure rarely reaches the small-scale farmers. By linking the smallholders to new infrastructure, we are giving farmers opportunities to expand their access to resources. Thus, we are giving them choices. A choice to use the modern inputs or continue with traditional methods, a choice to produce cash crops or subsistence crops, a choice to access micro finance and micro-insurance or to remain at risk to uncertainties. Thus, we are allowing farmers to have private sector products as an option and are enabling the private sector to access previously closed markets.

2. Shared Value Opportunities

What we need are multi-stakeholder and multi-dimensional solutions: so-called integrated solutions. By creating and retaining satisfied customers on a long-term basis, all stakeholders in our model will see benefits.

3. Mitigating Negative Private Sector Impact

The private sector is aware of the negative effects that high input agriculture has. They realized that if they want to stay in business, they have to change their strategies.

A good example of how private sector could be involved in a sustainable way is the Entomology line of Syngenta. Useful insects can have great advantages compared to traditional crop protection systems. Similarly, crop rotation and the use of legumes also have many advantages. So do integrated solutions, the combination of these techniques with the benefits of modern technologies. Because both approaches have their limits, they should be combined.

There is a lot of knowledge needed for these systems, for input providers and farmers. One possible way of involving indigenous knowledge and at the same time ensure knowledge distribution is by involving farmer groups in the development process. This has been done in cashew nut production in Tanzania. Farmers could sign up as groups and work together with scientists in approving their system and trying out different levels of inputs. In this way local knowledge can be used and combined with scientific knowledge. The private partners can then help to scale this up through the hub system.

Such approaches have to be subsidized in the initial phase, but on a long term they will be profitable. Having private business providing agro-ecological solutions such as insects for biological pest control, seeds for crop rotation etc. is a shared value opportunity because such methods are profitable as well as environmentally friendly.

It is crucial that there is independent information and education provided from the farmer alliance social centre. Such information enables them to see the real cost and benefits of different systems. Initially this can be supported by NGO's and Government, but as the Community Centre starts to take off, it will be able to provide this independently.

We believe that the farmers who are given information, education and access can take the right decisions. We should not tell them what's the right way but rather give them the ability and possibility to choose.

Synergies Across the Value Chain: A Win-win Solution for All

Smallholder production

- a. Increased income - through yield increases, access to markets, access to infrastructure (roads, storage, processing, power, water, other transport), access to micro-finance & micro-insurance. Quotas on local worker percentages;
- b. Increased participation – through education, participatory power, local level decision-making, public health;
- c. Ownerships schemes – initial ownership of Community Centre – later, devices such as financial ownership [shares, profit-sharing, micro infrastructure (tractors, seed distribution)].

Large-scale production

- a. Financial incentives - steady customer base, access to previously inaccessible arable land, infrastructure consistency (governmental and local support). Economies of scale and less individual risk (due to sheer grandeur of 3.4 billion investment = 5% of current GDP);
- b. Return on investment – long-term investment eventually turning in to massive local, regional and international customers for inputs and suppliers for outputs;
- c. Knowledge of how to implement PPP in other markets with even further potential for growth (particularly in an shrinking “western” market).

Conclusion

Our model empowers farmers in two ways:

Providing Choices to Smallholders

At all stages, farmers have the ability to shape their own future and make decisions for their communities. Farmer alliances will be closely involved in development efforts and smallholders can have a voice in their own role for future development in the community.

Providing Opportunities to Smallholders

We aim to advance the livelihood of smallholders by providing more opportunities through:

- a. encouraging funding for infrastructure development;
- b. establishing favourable conditions for private sector investment;
- c. improving smallholder access to markets;
- d. connecting farmers to share knowledge among each other.

The long-term goals for our project are:

1. Increased yields (to end food insecurity and to lift smallholders out of poverty);
2. Ensure that smallholders have ownership in facilities (through shares);
3. Encourage innovation for methods of “shared value creation” such as Fair trade certification, possibly under a new “East Africa” label;
4. Ensuring sustainability in all its four forms (environmental, economic, social and cultural).



MODEL B

A CRITICAL ALTERNATIVE TO THE GREEN REVOLUTION MODEL OF THE SAGCOT INITIATIVE

This section will outline the key ideas and proposals of a fully alternative model for the future sustainability of Tanzania. The model, created by Federico, Milja, Sylva, Mathias and Zeno, took a step back from the SAGCOT initiative. Rather than conforming to the underlying values of the SAGCOT Initiative, which the group saw as an industrialization approach to agriculture in developing countries, the group thought of the possibilities of Tanzania acting as a world leader in sustainable development.

Our model is based on:

- Shared knowledge systems and social learning;
- Farmers as experts, not recipients of information;
- Exclusion of corporate interests and privatisation of agriculture;
- Agroecology;
- Resilience and ecosystem service enhancement.

This model was created with a fundamental vision that agroecology can support smallholders and ensure long-term ecological resilience. The model questions the underlying values for food production – the idea of food as a market commodity or as a fundamental human right. The model focuses on the bottom up development of locally and culturally appropriate production methods that satisfies the immediate household and domestic food security.

This model is proposed by Federico Davila, Milja Fenger, Mathias Voges, Silva Lieberherr and Zeno Robbiani.

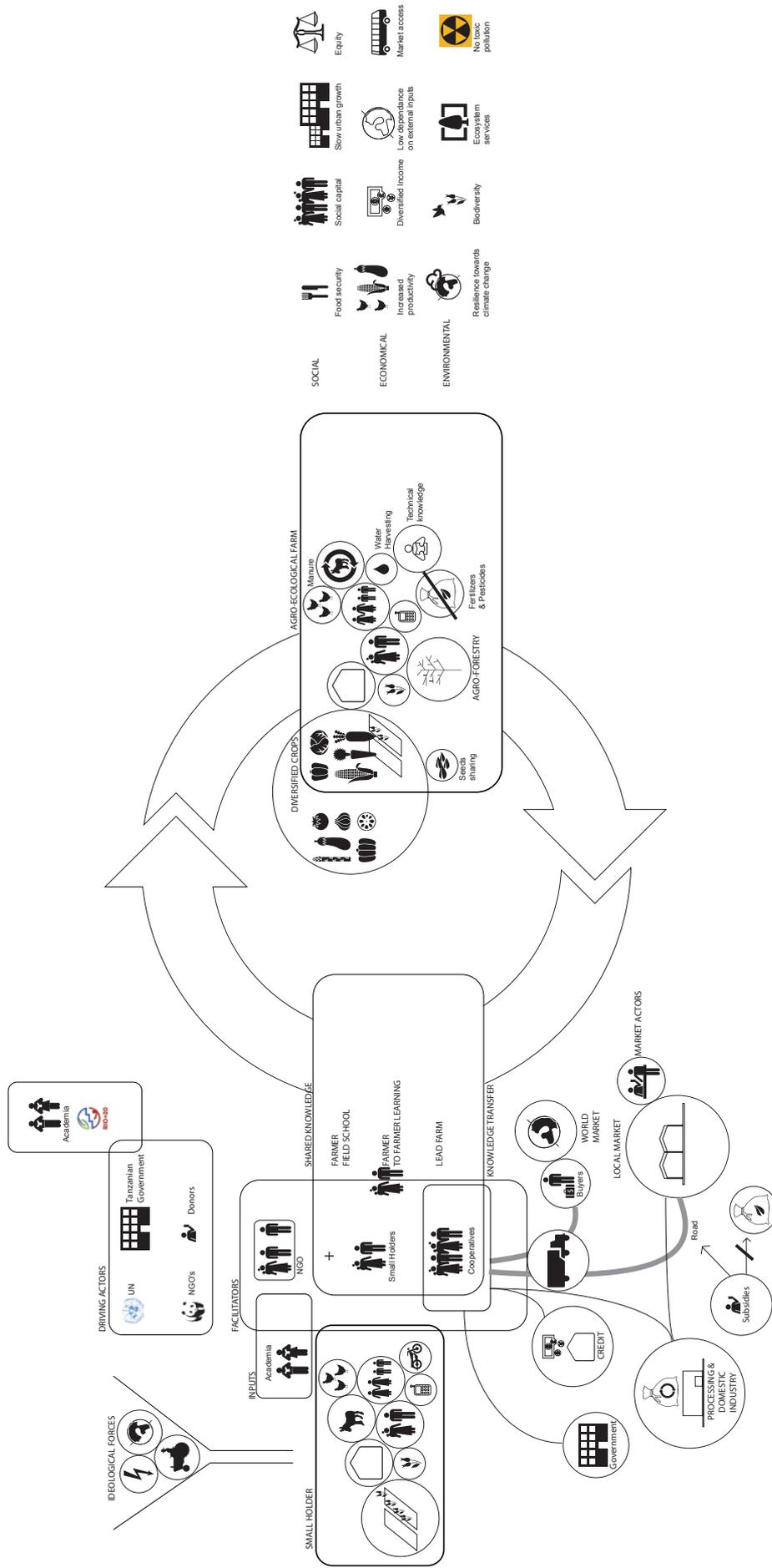


Figure 9: The knowledge sharing model for agroecological development in smallholder farms.

Investments flow into knowledge sharing and cooperative systems. Such a process enhances agroecological knowledge and production. This knowledge is then fed back into the system, positively reinforcing it. Numerous environmental, social and economic benefits emerge at the end of the model.

The Green Revolution: Context for our Ideas

The SAGCOT blueprint [1] plans to jump-start another green revolution in the southern corridor of Tanzania. In many areas across the world, specifically in the USA and South-East Asia, the green revolution has improved food security and created positive economic growth ever since its implementation in the 1960s. The African continent has not nearly profited as much from this global event as the industrialized world has. Many socioeconomic factors are at play when debating why Africa has ‘missed the boat’. Instead of perceiving sub-Saharan Africa’s current situation as a lost battle for the green revolution, the vast amounts of non-utilized arable land can be seen as a fresh start. It is now, more than ever, important to have another look at the practices supported by the green revolution and what has made them so beneficial for many. Yet, at the same time we need to be critical of its limitations and look for possible improvements or alternatives - all in the context of improving poor smallholder farmer’s livelihoods.

A critical analysis of past experiences concerning the green revolution was performed using the three pillars of sustainability framework: economical - cultural - environmental. Some important points arose from this:

1. A high input and high output agricultural paradigm can deepen the economical and social divide between rich and poor farmers, favouring a minority of economically privileged smallholders. In general, the majority of smallholders remain poor with a more bleak future than before having entered this paradigm. In a study analysing conclusions on equity made within reports and journal articles on the green revolution in India and Mexico, it was found that 80% of studies concluded that inequality increased between farmers due to the changes initiated by the green revolution [44]. Selling expensive technology and/or knowledge ‘packages’ (i.e. fertilizer, pesticides, high-yielding seed varieties, monoculture practices) creates a level of farmer dependency of which the risk is further exacerbated by the current integration of the agricultural and energy markets. Farmers who are initially capable of purchasing such packages have the potential to get themselves out of poverty. Socio-environmental influences, especially at the implementation of such packages are, however, critical for achieving this potential. For this reason, subsidizing said packages would likely not bridge the income divide in the long run [43]. To conclude, any improvement or alternative should give the farmer mobility in income and a means of escaping a vicious cycle of poverty; i.e. value should be created - decentralized - from the bottom-up and foreign inputs are preferably set at a minimum. It is important to note that knowledge sharing/dissemination should be facilitated to prevent knowledge gaps, which could similarly lead to disparity in productivity.
2. The green revolution has created a global agricultural trend towards monocultures, which reduced dietary diversity and caused malnutrition. This has led to the loss of about 7000 traditional rice varieties and many fish species [45]. During much of the green revolution, particularly in Mexico and India, farmer participation has been minimal. An increase in farmer participation could help preserve agro-biodiversity by capitalizing on indigenous knowledge of farmers and using native species for on-farm value [46].
3. In areas highly impacted by the green revolution HYVs (high yielding seed varieties) cultivation has removed important nutrients and organic matter from the soil, which cannot easily be replenished by the fertilizers sold in these regions [48]. This soil erosion has increased the inputs required by the farmers, thus increasing their dependence on inputs and placing the economic value of their farm at risk. Another limitation to the methods of the green revolution is extensive irrigation. In the Indian Punjab area, for example, 80% of the ground water for irrigation is labelled “overexploited or critical” [47]. In general, an alternative model should incorporate not just low-input agriculture, but take into account closed loop systems for farm sustainability.

Program Initiation

The fact that the Tanzanian Government committed to the SAGCOT initiative demonstrates that the country's governing bodies are committed to developing the agriculture of the country. This commitment, however, is creating the capacity for private corporations to capitalize on the poverty of smallholder farmers in the country and find new customers for their agricultural produce.

The Tanzanian Government should rather consider alternatives, and inform itself on the potential that agroecological systems have in enhancing the country's agricultural development. The International Assessment on Agricultural Knowledge, Science and Technology for Development [34] demonstrates the agreement that exist in the scientific community in arguing that business-as-usual models will not save agriculture. These ideas should encourage the Tanzanian government to reinvest the money being spent on agricultural inputs and transfer it to public goods to facilitate agricultural development.

Along with this, donor agencies and NGOs are encouraged to take up the same vision, along with the commitments made at Rio+20, which focus on the production of agriculture as a human right. NGOs and donor agencies have great capacity of developing 5-year programs that facilitate the development of agroecological knowledge. Such public sources of financing are often criticized for establishing projects for short periods of time that crumble once the donor leaves. We argue that once an agroecological farm is up and running, along with farmer-to-farmer learning systems, the role of NGOs and other donors is minimal.

The funding provided by the Tanzanian government, donors and NGOs would flow into the capacity building of farmers and the establishment of a farmer-to-farmer learning system.

A Knowledge Revolution

In order to enhance agroecological knowledge, our model focuses on the *campesino a campesino* (farmer to farmer) methodology discussed by Holt-Gimenez [41]. The methodology created an opportunity for horizontal learning amongst farmers, where they were the experts and generated innovative solutions with one another.

The *campesino a campesino* movement has been thoroughly researched by Holt-Gimenez [41]. The process

is based on a horizontal learning methodology, where the farmers are the innovators in finding solutions that are common amongst groups of farmers. Reciprocal learning from peers is part of the movement, where innovative solutions in one farm are shared amongst farmers freely and openly. This also leads to a stronger sense of trust, which can often not exist when a foreign agronomist from a western urban dwelling is brought in.

Knowledge Facilitators

Our model does not exclude agricultural extension officers. Rather, we redefine the role that such officers play in the creating of agroecological knowledge. The role of these individuals is to facilitate knowledge between farmers and ensure that farmers can get together to learn together, rather than teaching farmers what to do. This generates a capacity for farmers to be the experts in the knowledge sharing process, rather than just recipients of information.

Such horizontal learning processes are essential to develop agroecological knowledge. Rosset et al [42] states that “The fact that agroecology is based on applying principles in ways that depend on local realities means that the local knowledge and ingenuity of farmers must necessarily take a front seat, as farmers cannot blindly follow pesticide and fertilizer recommendations prescribed on a recipe basis by extension agents or salesmen.”

Rossett et al [42], state that the pedagogy of the farmer to farmer movement is based on the following five principles:

1. Begin slowly and on a small scale. Farmers try out new methods on a small part of their land, without rushing.
2. Limit the introduction of new methods. People get overwhelmed when they try many new practices at the same time.
3. Achieve rapid and recognizable successes. The process works best when farmer promoters first teach things that they are sure will have a rapid positive impact, because people are motivated to continue participating.
4. Carry out small-scale experiments. Everyone is encouraged to experiment on small areas of their own land, without risking their entire harvests. The more farmers who become active experimenters, the faster the overall transition advances.
5. Develop a multiplier effect. As more peasants become promoters and experimenters, the process begins to demonstrate a self-catalysing momentum.

Lead Farms and Farmer Field Schools

Following information from the campesino a campesino movement discussed by Holt-Gimenez and Rosset, we also propose that donors, NGOs and political initiatives from Tanzania facilitate farmer field schools and lead farm visits.

Such activities would allow farmers to see agroecology in practice, rather than just learn about the principles of ecosystems with each other. Seeing other successful agroecological examples working and reducing the dependency on external agricultural inputs can encourage farmers to take up similar practices.

1. Farmer field schools: Such field schools can run for one or two days, and would ideally mobilise farmers from different parts of the country. The field school would bring farmers from Tanzania together to a farm already engaging in agroecological practices, where farmers can discuss and learn the methods and communicate them back to their regions.
2. Lead farms: these should exist in smaller farm communities. Example farms of successful agroecological management should be encouraged, where farmers can come visit and learn.

Social Learning

Building up the capacity of farmers to meet and innovate will enhance create a social learning process within farmer groups in Tanzania. Social learning is the collective action and reflection that occurs amongst individual to improve the management of socio-ecological systems [40]. Engaging in on-going critical reflective analysis of the agroecological knowledge development of the farmers allows the group to identify what is not working in the process. From this identification, improvements can be made through internal group innovation.

Use of E-resources

The learning process can also be facilitated by the use of modern technology. Up to 97% of Tanzanians have access to a mobile phone. This technology can be used to establish SMS knowledge dissemination programs. Such programs would encourage farmers to report other farmers from the country on the progress of their agroecological transition.

In the future, private micro-businesses should seek to develop access to affordable Internet access in remote regions. Through being connected to the Internet, farmers can enhance their communication with agroecology researches and institutes. It would also facilitate communication with international farmer organisations, such as La Via Campesina.



Figure 10: Group B discussing their model.

Agroecology

Through creating social learning environments where farmers can learn from one another, agroecological knowledge is shared and developed. Farmer groups, with the support of agricultural knowledge facilitators, can:

- Maximise local knowledge on what native plant species grow when;
- What natural predators exist on the landscape;
- Think of innovative farm layout redesigns to maximise water retention;
- Discuss the specific time livestock can be on the farm before becoming harmful.

Agroecology, as defined by Altieri [33] are not intensive in the use of capital, labour, or chemical inputs, but rather intensify the efficiency of biological processes such as photosynthesis, nitrogen fixation, solubilisation of soil phosphorus, and the enhancement of biological activity above and below ground.

Agroecology research demonstrates that small-farms are just as productive, if not more, than conventional farms. The term conventional farm, for the purposes of this model, is defined as one that grows a single crop per hectare with the support of synthetic fertilizers and pesticides.

Peasant and smallholder farms are essential for global

food security. Almost 50% of global produce is grown from small farms in Latin America and Asia. Due to the small size of these farms, peasant farmers grow in diversified systems.

Productivity and Agroecology

Sufficient research has been carried out to disprove the idea that small-holder farms are unproductive. Small holder farms (2 ha or less) are more productive per unit of land if total output is considered rather than yield from a single crop [36]. On average, yield advantages from taking up agroecological practices can range from 20%-60% [36] and increase over time.

The yield from a single crop mentality has blinded the nature of agricultural development since the advancement of the green revolution. Market driven agricultural policies have focused on promoting the mass scale production of global commodities, largely staple crops (maize, rice). Agroecology can still contribute such commodities for the world market, however practices on the farm also support the immediate household food security of smallholder farmers.

Agroecology radically challenges the notion of growing food solely for the purposes of the global market and it generates culturally appropriate food that satisfies immediate household food security.

Fertilizers and Agroecology

Agroecological practices on the farm aim to reduce the use of synthetic fertilizers to enhance plant growth. In order to deliver the basic macro and micro nutrients plants require for natural growth, agroecology maximises on farm nutrient cycles and the integration of livestock to enhance nutrient cycles.

There are two key ways of enhancing natural nutrient cycles in farm systems: vegetation and livestock

Vegetation

Nitrogen fixing plants, such as legumes can be inter-planted in agroecological systems to provide natural nitrogen fixation. Developing an understanding of what native species can fixate nitrogen can easily enhance farmer's access to natural nutrients without having to buy expensive, fossil fuel based synthetic fertilizers.

Livestock

Livestock includes ruminants, porcine, poultry and fish organisms that excrete nutrients on a daily basis. Having these organisms integrated into crops significantly enhances the availability of natural fertilizers. Along with this, animals in farming systems can mix up soils and enhance soil microbiota.

Pesticides in Agroecology

Insect communities can be stabilized by constructing vegetative diverse agroecosystems that support natural enemies and/or directly inhibit pest attack [35]

The push-and-pull technique is a classic example of where natural predation works well, and is of minimal cost to the farmer. Planting the native African silverleaf, maize insect pests are 'pushed' off the crop naturally. At the same time, the farmer has napier grass within neighbouring paddocks, which naturally attract the pest. Napier grass generates toxic substances that kill the pest, whilst also providing palatable vegetation for livestock. Silverleaf increases soil fertility due to nitrogen fixing capacities, whilst generating seeds that can create a new produce for market delivery [39].

Culture and Agroecology

It is important to note that agroecology is rooted in indigenous and traditional farming methods, and no one size fits all. Through using complex traditional knowledge that smallholders have, the productive capacity of agroecological systems can be enhanced.

Unlike the SAGCOT initiative, which directly imposes the view that food is a market commodity that should be grown using the Green Revolution mechanisms western

agriculture used in the last 50 years, our model does not focus on telling farmers what to do. Rather, the farmer-to-farmer methodology capitalises on the farmer's expert knowledge to enhance agroecological practices.

Worldview Differences: How Corporations cannot Engage with Agroecology.

The argument is made that companies are already engaging in agroecological practices by developing entomological crop protection. In principle, this is true, as private industries are relying less on artificial chemicals and breeding natural predators. In our model, however, we argue that there is a fundamental misconception in private corporations of what it actually means to be agroecological in practice. Our model also critically questions the need to buy external natural crop protection.

Agroecology has evolved from being a science to a systemic understanding of food systems [37, 38]. It capitalises on indigenous and peasant knowledge, and works best under the horizontal learning methodologies discussed in the next section. Agroecology directly questions the need to have to purchase inputs. Rather, it minimises the dependence of farmers on any external inputs.

If a corporation develops a crop protection product based on entomological defence, the farmer still needs to buy it. In order to buy this expensive input, the farmer either has to sacrifice another purchase (e.g. books for school) or depend on governmental subsidies for fertilizers. There lies the lack of systemic understanding of corporations. Cycles of dependency are perpetuated in a model where crop protection just shifts from being based on chemicals to being based on natural pests.

Rather than buying such protection, why should farmers not be encouraged to use the natural predators that exist within a landscape? The push-and-pull pest control techniques described earlier is a perfect example of using these free ecosystem services to protect crops.

Through creating a system where farmers are still required to buy external inputs, multinational agri-businesses are perpetuating the exact same dependency cycles that the Green Revolution created in other parts of the world. Natural ecosystems do not require any human activity to function; biological legacies and ecosystem services provide the necessary nutrients for systems to stay alive. Our model formally excludes the role of agri-businesses and the development of a fertilizer and pesticide market in Tanzania, as it will only create dependency in farmers and not address genuine sustainability.

Building Cooperatives

Cooperatives play an important role in facilitating the farmer-to-farmer learning as well as farm-based research. Furthermore, cooperatives can enhance smallholders' access to and position in markets. The following chapter will outline the role of cooperatives in more detail.

Cooperatives have a long history in Tanzania. They started in the 1930s and played a crucial role in the rural economy and social life – especially in the first decade after independence. In the 1970s, the cooperatives were nationalized and many suffered from corruption and mismanagement [20, 21]. When Tanzania implemented the structural adjustment programs in the 1990s, subsidies for agricultural inputs, extension services and infrastructure went down dramatically. This lowered the overall productivity of the agricultural sector and has hit the cooperatives particularly [22]. They have not been competitive and became rather insignificant later [20, 21]. Recently the government of Tanzania has realized the great potential cooperatives have for the livelihood of smallholders and for the prosperity of rural areas. So the government, together with the International Labour Organization, initiated the Cooperative Reform and Modernization Program that is currently in the process of modernizing and reforming the existing as well as building new cooperatives [20, 23].

Additionally, cooperatives across Africa are gaining strength and start organizing themselves [24]. The agroecological model could therefore capitalize on this existing structures and efforts when strengthening the cooperatives.

A lesson to be learned from past experiences of cooperatives is that they must come from the farmers' initiatives and grow organically – potentially with state support and facilitation [21, 25]. It has been shown that NGOs are often the right partners to facilitate the development of cooperatives. They can take initiative and educate the farmers about possible ways of how to manage and develop a cooperative. When it comes to concrete organization and constitution, it is crucial that the farmers themselves can decide on the trade-off between social inclusion, participation in decision making and marketing performance [26].

The most obvious benefits of cooperatives are related to markets and will be discussed in the next chapter. But there are also non-market benefits, such as facilitation of farmer-to-farmer learning (e.g. about agroecology), increased agency in the state and increased social capital. The non-members of a cooperative can also benefit in the form of spillover benefits (e.g. training, access to knowledge, infrastructure) or improved food security. However, the services of a cooperative can also be exclusive for members or even aggravate non-members access to certain services (e.g. credit). The impact of

cooperatives on marginal members or non-members therefore depends on a concise constitution that prevents exclusive behaviour or elite take-over [26, 27, 28, 29]. Finally, there are many studies discussing the success factors of cooperatives. They have to be taken into consideration when building up new cooperatives (see e.g. [30]).

Improving Access to and Position in Markets

When it comes to local markets, there are two main problems for smallholders in Tanzania: no physical market access and low negotiation power. The bad status of roads hinders the farmers from bringing their crops to the local markets. The agroecological model would address this problem by reorganizing the public finances. Currently, the state of Tanzania spends 52 million USD per year subsidizing agrochemicals and synthetic fertilizer [23]. This money could be spent on public goods such as roads in order to increase access to markets for smallholders.

The second problem could be improved through the benefits of cooperatives. Through cooperatives, smallholders can benefit from economies of scale e.g. in harvesting or transport and lower their transaction costs per unit. Further, cooperatives can increase their members' access to credits and improve their position in the value chain (through vertical integration of basic downstream processing industries). Most importantly, cooperatives give smallholders a greater negotiation power and weaken the middlemen's position. Cash crops (nationally or internationally traded) are crucial for the income generation of farmers. It is of particular importance to protect them from exploitative contract conditions and price shocks. Building cooperatives could make the contact to buyers significantly easier and therefore help to build fair, long-term contracts that flatten price volatility [27, 30, 31].

For the rural economy to work sustainably, it is crucial to build up a domestic industry. The agroecological model focuses on domestic, rather than foreign direct investment, because the benefits of the latter are far from being proven (see [32]). It is immanent in our model that the development of infrastructure and local markets fosters the growth of local industries and businesses. Businesses that are connected to sustainable agricultural practices in a wider sense would profit from flourishing agroecological farms. Examples are waste management companies, nurseries, processing industries, tourism, knowledge industry or trade-based business.

To summarize, the development of cooperatives and the strengthening of the local economy would enable a truly sustainable, slow and steady growth and an improvement.

The Benefits of an Agroecological Revolution for Tanzania

There are a variety of benefits that are to be expected under the new agriculture paradigm that we propose. These can be divided into three dimensions: environmental, social and economic.

Environmental

1. *Climate change adaptation* - Agroecological systems are more resilient to both drought [8] and extreme weather events [9] such as hurricanes. With climate change an issue over the coming century it is expected that Tanzania will suffer more frequently from these types of events and can thus benefit from increased resilience.
2. *No toxic pollution and fertilizer run-off* - By using significantly less synthetic fertilizer and agrochemicals we avoid destructive toxic pollution and fertilizer run-off. The latter can cause severe eutrophication of rivers and lakes. Many Tanzanians rely on fish and other food from these wetlands [10] it is therefore wise to avoid their degradation.
3. *Soil fertility build up opposed to soil degradation* - Over time agroecological practices can contribute to the fertility of soil [11]. On those areas where previous overuse of synthetic fertilizer has degraded the soils, agroecology can play a regenerative role.
4. *More efficient use of water* - Due to build-up of organic matter in the soil, water retention can be many times higher than in other farming systems [12]. Water harvesting techniques can also be used to improve yields. A combination of these factors can lessen the need for development of irrigation schemes. Tanzania's wildlife parks are a major tourist attraction. Decreases of water flows into wetlands, such as those that have been observed in Tanzania's Great Ruaha River, in relation to rice farm irrigation, pose a serious threat to wildlife populations [13].
5. *Prevents loss of biodiversity* - Traditionally, agriculture intensification and extensification can cause loss of biodiversity both on and around the farm. Agroecology is designed to minimize both these risks.

6. *Maintains valuable ecosystem services* - Many "services" (e.g. pollination, nutrient cycling) provided by the ecosystems on our planet do not only have intrinsic value but also a large economic value [14]. Modern agriculture has played a large role in diminishing ecosystems' capacity to provide these essential and valuable services.
7. *Climate change mitigation* - Agroecology delinks food production from the reliance on fossil energy (oil and gas). It contributes to mitigating climate change, both by increasing carbon sinks in soil organic matter and above-ground biomass, and by avoiding carbon dioxide or other greenhouse gas emissions from farms by reducing direct and indirect energy use [15].

Social

1. *Hidden hunger* - The shift from diversified cropping systems to simplified cereal-based systems following the green revolution model has contributed to micronutrient malnutrition in many developing countries. Nutritional diversity, enabled by agroecology through increased diversity of produce on the farm, is of particular importance to children and women [16].
2. *Increased participation and agency for farmers* - Farmer-to-farmer learning and well-functioning cooperative structures empower farmers by helping them to organize themselves better, and stimulate continued learning.
3. *Lower workload* - While labour intensive in the first two to three years, agroecological farms require less work over time. Hours spent farming are expected to decrease compared to normal smallholder farming methods [17].
4. *Less migration to cities* - Many young rural people across the developing world see farming as an unattractive way to make a living. As a consequence, rapid urbanization in many countries is occurring. With expected increased income and less labour, farming can become attractive again.

Economic

1. *Income increase* - While yields rise [11], the cost of farming does not.
2. *Lower reliance on external inputs* - By enhancing on-farm fertility production, agroecology reduces farmers' reliance on expensive, external inputs and state subsidies. This then makes vulnerable smallholders less dependent on local retailers and moneylenders [18].
3. *Economic development* - Growth is expected to be modest and slower than in a model like the SAGCOT initiative, but economic development happens locally and avoids Tanzanian capital flowing into foreign hands. Strategically-planned 'Local Economic Development' strategies (LED) can provide a flexible and effective approach to simultaneously enhance economic growth and reduce poverty [19].

Conclusion

With our model we not only question the underlying values of the green revolution, but also propose an alternative solution for genuine sustainable development in Tanzania. We would like to emphasize that we believe that it is vital to place the farmer, and not international agribusiness at the heart of agriculture.



CONCLUSION

COMPARING THE TWO MODELS AND OUTLOOK

Common Points and Differences

As explained in the Process Chapter, we decided to split into two groups and develop two models in parallel. For practical purposes and better understanding, these models have been named A & B and were presented extensively in the previous sections. This section explores the similarities and difference between the two approaches.

Differences

1. *Financial model* - Model A is accepting the SAGCOT financial schemes and the fact that private investors are willing to commit, with the primary interest of reaching – or building up - a market in small Tanzanian farmers. Model B does not accept private sector top-down approach and rejects the SAGCOT scheme as unfit for improving stallholder livelihoods.
2. *Stakeholders* - Model A recognized the actors offered by the SAGCOT project as valid and will involve them. Model B does not include investors and local banks as stakeholders. Also, input suppliers and international private business are not part of that scheme.
3. *Fertilizers* - While insisting on giving farmers the choice between synthetic fertilizers and manure, Model A is accepting those inputs. Model B considers synthetic fertilizers as harmful and largely exclude them from the scheme.
4. *Approach* - Model A is based on a business driven investment that insists on local level participation as a key element of improving the SAGCOT project and binding contracts as a way to mitigate the negative effects that could be generated by the plan. Model B considers business driven investment as harmful

from the start and proposes a bottom-up approach towards agroecological farming, while increasing farm productivity through knowledge, farmers cooperatives and ecologically-sensitive farming.

Common Points

1. *Small farmers empowerment* - Model A & B claim empowerment of farmers as central to both schemes and attempt to highlight the importance of farmers as actors of their own development.
2. *Education/Knowledge* - Model A & B are both focusing on the prominence of knowledge as an essential factor of improvement, and on the significance of technological enhancement for communication.
3. *Participation* - This is certainly the most crucial element to be taken from this case study: FARMERS MUST BE INVOLVED (at any stage of any project). Regardless of which project or vision addressed, the two models insist on an element missing in the SAGCOT blueprint: PARTICIPATION. Through farmer's alliances for model A, or through cooperatives for Model B, the self-dependency and self-governance of local populations appears as a crucial and central element that is not to be ignored. Because of the context of the exercise, participants have been aware of neo-colonial issues such as land grabbing or imposed projects on poorer populations and both models have concerns on how the way projects should be implemented. Both models strongly consider that, with or without private investments, local populations must remain in charge.

Outlook

Both groups have attempted to find means for improving smallholder livelihoods in Tanzania. Our passionately different views have crystalized into two separate models for implementing a developmental solution. Creating these two models has been challenging and fruitful. Now we would like to leave you with some individual reflections on what we have learned from the course and the summer school in general:

“I have learned that finding effective incentives and funding for a given model is as difficult as shaping the structure of the model itself.”

“I learnt that it is very difficult to find compromise with people you’re working with. People tend to have strong convictions that they usually not ready to question. I now have a better idea of how it would be to negotiate not only with 10 but with 100 people.”

“I have learnt about the many problems and challenges facing smallholders.”

“I was challenged to re-evaluate my worldview and the assumptions it was based on.”

“That the fundamental ideological barriers that exist in the world act as barriers to genuine sustainability”

“There are various ways to approach a solution, each one is equally valid.”

“To work in a big group and listen to everyone’s voice is key. And even though people agree on a lot of things, it is still really hard to come up with a solution that fits everyone.”

“I have learned that in complex problems such as our case study, it is crucial to remain unemotionally attached in order to produce a majority-supported solution.”

“Trying to come to a common solution with people with very different world views is highly challenging – even if there are so many grand, innovative ideas about how to change the world to the better.”

“Being confronted with the enormous challenges of rural development, I have learned that people have thought of many fantastic, ingenious solutions to these real-world problems. It gives me hope!”

“Confrontation can be fruitful.”

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Figure 11: The Students of the Smallholder Livelihoods Case Study.

The views represented in this report do not necessarily represent the views of all the participants. Furthermore there is a distinct division of opinion and values within the group. Please consider this when reading the report.

Group B would like to state as a disclaimer that there is no association whatsoever between group B and the ideas in the SAGCOT initiative or Model A.



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