# THE AGRICS APPROACH – INVENTORY OF EXTENSION PRACTICES IN KENYA AND TANZANIA

BIOMASS RESEARCH REPORT 1503

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geodatics smart advice

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# PREFACE

Global population will reach 9 billion by 2050, increasing the demand for food by an estimated 70%. Arable land availability is expected to increase by 15%. As sufficient water is not easily accessible and the weather increasingly is becoming less predictable, a more effective and efficient food production is essential to ensure future food availability. Providing the right information at the right time to food producers like farmers, pastoralists and fishermen can help to improve and increase food production in a sustainable manner, thus ensuring food security on a global scale.

The combination of improved mobile connectivity, new satellite services and private investments offers a unique and exciting opportunity for scaling up new innovations and existing knowledge to an implementation and operation level so-far unheard of. The growing fleet of satellites encircling our planet ensures a continue global observation coverage and provision of data that are freely available.

Studies show that information from satellites and other (geo)data can be translated into agricultural advice, enabling higher crop yields and a more efficient use of seeds, water and fertilizers. Food producers can also receive early warnings for drought, flooding and/or diseases, while mobile phone technology based services providing up-to-date market prices have already been proven successful in Africa and India. Moreover, the quantity and quality of communication networks will enable millions of food producers in remote areas to benefit from relevant agricultural information allowing them to make better decisions.

The recently initiated Geodatics project is a pathway that will result in spinning off a social enterprise so as to ensure delivery of agronomic geodata-based information services to smallholder farmers in Western Kenya and Northern Tanzania. The project is executed by ICS Foundation, together with Wageningen UR (NL), Agrics Ltd. (Kenya), Manobi Ltd. (Senegal) and Biomass Research (NL).

Setting up such an initiative requires a solid knowledge base as well as an organization structure allowing efficient management of reliable information. All project partners are involved in this process. The role of Biomass Research is to provide an overview of data that will be collected and implemented in the project, specifying how the existing Agrics knowledge base can be improved and supplemented with scientific data on crop and soil management as well as satellite images.

This report describes the way Agrics supports their advice services by using available information on soils, crops and weather. The main focus is on identifying existing knowledge and data sources and exploring potential ways to integrate them in the information flow and knowledge base needed for a successful development of Geodatics.

I am very grateful to project partners, especially Agrics staff, for providing crucial information and useful feedback. Any errors in the report remain responsibility of Biomass Research.

Wageningen, November 2015
Hans Langeveld

# ABBREVIATIONS

| | |
|---|---|
| ASDS | Agricultural Sector Development Strategy |
| CAN | Calcium ammonium nitrate |
| CBO | Community Based Organization |
| CF | Community Facilitator |
| DAP | Di-ammonium phosphate |
| F | Farmer |
| FC | Field Coordinator |
| FG | Farmer Group |
| GL | Group Leader |
| ICT | Information Technology |
| KES | Kenyan Shilling |
| MAFC | Ministry of Agriculture Food Security and Cooperatives |
| NALEP | National Agriculture and Livestock Extension Programme |
| NASEP | National Agricultural Sector Extension Policy |
| NGO | Non-governmental Organization |
| NSO | Netherlands Space Office |
| RFC | Regional Field Coordinator |
| TZS | Tanzanian Shilling |

# 1. INTRODUCTION

In July 2015 the Netherlands Space Office (NSO) granted the Geodatics project. Geodatics is a social enterprise that is going to be set up to deliver agronomic geodata-based information services to smallholder farmers in Western Kenya and Northern Tanzania. The project will be executed by ICS Foundation, Wageningen UR (NL), Agrics Ltd. (Kenya), Manobi Ltd. (Senegal) and Biomass Research (NL).

The advice service that will be developed in the Geodatics project will be based on an existing package deal of Agrics, currently provided to 10,000-12,000 smallholder farmers in Kenya and Tanzania. This package consists of crop seeds, fertiliser, SMS information services and training. Pictures 1.1, 1.2 and 1.3 illustrate current practices of Agrics. The information in the package will be expanded with geodata-based information delivered in an expanded mobile-phone service. The advice will be science based, supported by weather and satellite-based information while being integrated with farmer requirements and opportunities.

This report provides information on the current operations of Agrics that will serve as a starting point for the Geodatics project. It is organized as follows. Chapter 2 provides an overview of existing data sources and extension models in the study area. A description of the standard Agrics information model is presented in Chapter 3. Chapter 4 provides a brief conclusion.

*Picture 1.1. Distribution of improved seeds and fertilizer.*
*Source: Agrics Kenya.*

*Picture 1.2. Female farmer harvesting maize.*
*Source: Agrics Kenya.*

*Picture 1.2. Transport of maize cobs.*
*Source: Agrics Kenya.*

# 2. PRESENT EXTENSION MODELS

This chapter presents an overview of dataflows commonly used by traditional agricultural advisory systems in the study area.

Extension services are reportedly one of the most common forms of public-sector support for knowledge diffusion and learning in agriculture. They have the potential to inform farmers on research results and help them to improve cropping practices, adjust input use, and implement more productive varieties (Deschamps-Laporte, 2013). Extension workers can further help farmers to improve their managerial skills by organizing them, and exchanging experiences of demonstration plots.

The current information services are mainly provided by the governments and NGO's with the support of several local research institutes. In Kenyan regions where Agrics or similar organisations are not active, farmers are advised by extension officers working for public extension services on an individual basis. This is depicted in Figure 2.1.

In theory, extension officers collect, analyse and integrate available information on prevailing soil and weather conditions as well as information on farming conditions, farm structure and farming family composition before formulating advice to farmers. Soil and weather data usually are publicly available, as are generic data on crop varieties, fertilizer composition and farm structure. Data on local farming conditions and family composition are private.

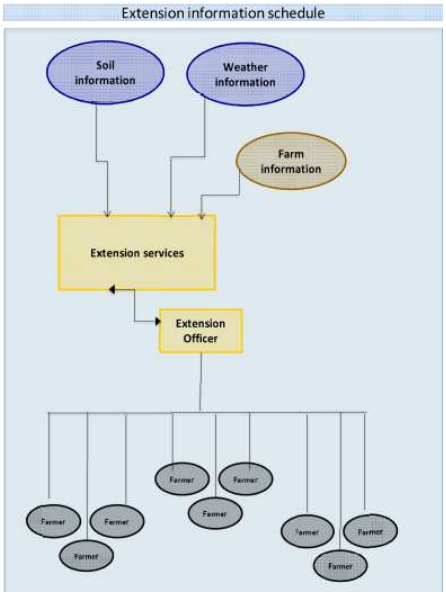


*Figure 2.1. Traditional Extension information flows.*

### *Kenya*

Agricultural extension in Kenya dates back to the early 1900s, but its only notable success was in the dissemination of hybrid maize technology in the late 1960s and early 1970s (IFPRI, 2015a). Since then, Kenya has known a number of restructures of extension services.

Kenya has implemented a number of extension systems, including 'whole farm extension', 'integrated agricultural development' and the 'Training & visit' approach. Weaknesses of these approaches include a top-down focuc and high demand on human, capital and financial resources. The weaknesses were addressed by the introduction of the National Agricultural Extension Policy (NAEP) and associated extension programme (National Agriculture and Livestock Extension Programme - NALEP) which articulated the importance of client participation and demand-driven extension systems. NAEP considered the role of the private sector and need for a pluralistic extention system, while defining perspectives for commercialization and privatization of extension activities. Inadequate institutional settings, lack of a proper legal framework, lack of commitment of staff invovled and slow flows of resources die however make implementation of NAEP less successful than initially was anticipated (Government of Kenya, 2012).

An evaluation of NALEP presented by Deschamps-Laporte (2013) suggests that the program helped farmers to change cropping practices by increasing fertilizer application levels without affecting crop productivity. According to the author, this might be explained by a short involvement in the region (one year) drastically reducing the potential for improving knowledge on techniques that happen only once a year (i.e. water harvesting, top-dressing). Further explanations could be limitations in resources available or a lack of valuing of the services (which were provided for free).

At present, three extension services are found. Next to the classical public extension service, additional advice is offered by commodity oriented public services (addressing farmers that produce a specific crop, e.g. sugar cane, of animal type, e.g. dairy farm) as well as private organizations (Muyanga and Jayne, 2006). The generic governmental extension system is demand driven. This means farmers have to approach the extension officer for information. Costs associated have to be covered by the farmers. In practice, farmers often are reluctant to bear these costs.

Challenges for a successful development of extension management services in Kenya as defined in the National Agricultural Sector Extension Policy (NASEP; Government of Kenya, 2012) include the need to:

- Develop private sector-operated services to complement public extension services
- Commercialize and privatize public extension services without compromising public interest
- Harmonize approaches and methods to promote demand-driven extension and capacity building for grassroots institutions
- Address institutional weaknesses in capacity building and technology development and dissemination
- Create institutional frameworks that can coordinate and provide linkages among stakeholders involved in the provision of extension facilitating factors.

### *Tanzania*

Agricultural extension in Tanzania is almost entirely financed by the public sector represented by the government through the Ministry of Agriculture Food Security and Cooperatives (MAFC). Prior to decentralization, MAFC had the mandate to provide extension services to the whole country. Other actors supplementing extension delivery in the field may operate as

private for-profit firms or private non-profit agencies. The latter may be further classified into member-based organizations and nongovernmental organizations (NGOs) that are not member-based. In most cases, private agencies do not specialize in providing advisory services but combine advisory services with other services (IFPRI, 2015b).

Major reforms were implemented to limit the public role in extension, and pass on commercial activities to the private sector were provided by the Agricultural Sector Development Strategy (ASDS) formulated in 2000 and 2001. The overall function of MAFC as extension service provider was limited to technical support to local authorities and an enabling environment for public extension services at the farm level. It is reflected in increased private and NGO participation in the production, processing and marketing of agricultural inputs and produce (IFPRI, 2015b).

According to IFPRI, the level of information and communication technology (ICT) in Tanzania still is low compared to its potential. Agricultural extension workers recognize the huge potential of its potential for rural development in this country, even for poorer farmers. Mobile services spread rapidly into the rural areas. World Bank statistics from 2009 suggest that 40 percent of the Tanzanian population own and operate a mobile phone. This will have increased substantially especially over the last three to five years. Mobile phones are used for services such as banking (paying bills, sending money, paying school fees), which ensures mobile technology is bound to play a key role in extension services and information delivery (IFPRI, 2015b).

The use of computers and access to internet service is increasingly used by extension services to reach farmers be it that the use of computers and internet services in Tanzania still is limited. One and a half percent of the population had access to internet in 2009. There is potential for cross-sectorial collaboration on information channels, products, and services, with ICT complementing other extension and knowledge services. This would, however, require a solid knowledge of the way farmers are currently accessing information (IFPRI, 2015b).

# 3. AGRICS

## *3.1 Introduction*

Agrics started as a social business program run by ICS in 2011. Agrics Ltd, registered in Kenya is operational in Western Kenya and was formally registered in October 2014. Similarly, in Tanzania, Agrics social business Tanzania Ltd was registered in May 2015 and is operational in the Northern region of Tanzania. ICS BV (Investics) acts as the holding company for Agrics.

Agrics is currently (November 2015) working with about 13,500 smallholder farmers in Western Kenya and Northern Tanzania and focuses on the most important value chains for smallholder farmers, being maize and vegetables in Kenya and maize, sunflower and vegetables in Tanzania.

The goal of Agrics is to improve the living standards of smallholder farmers in a sustainable way with a so-called input credit program. To this end, Agrics Ltd. procures high quality agricultural inputs, amongst others chemical fertilizer and planting seeds, off-season when prices are low and sells and distributes them to smallholder farmers on credit at the onset of the production season. Repayment of the loan starts immediately. In addition, Agrics builds the farmers' capacity by providing them access to up-to-date and practical knowledge related to agricultural practice (including the right use of fertilizer and seeds) and stimulates them to use this knowledge to improve their farm practice. Agrics also plays a role in facilitation of market access for the smallholders.

Agrics has developed a strong network of trustworthy suppliers in agricultural raw commodities. It also works with the relevant Agricultural Ministries to guarantee the continued quality of these raw materials.

For Agrics a good functioning information system is key as inputs are distributed and information is passed from Agrics head office to farmer groups and for repayment of the credit the flow goes in the reverse direction. The Agrics approach typically involves a number of actors including community facilitators (CF) playing an intermediate role – transferring knowledge to farmers while helping them to organise themselves in a process of education and improved input use. In this model, a field coordinator (FC) coordinates the community facilitators. There are some differences between the approach in Kenya and Tanzania as will be explained in this chapter.

The Agrics information schedule is presented in Figure 3.1 and involves the following actors: farmers, organized in farmer groups, group leaders, community facilitators, field coordinators and regional field coordinators. A short description is provided below.

*Farmer (F)*. Farmer who enrols in the Agrics credit scheme and becomes a member of a Farmer Group (FG).

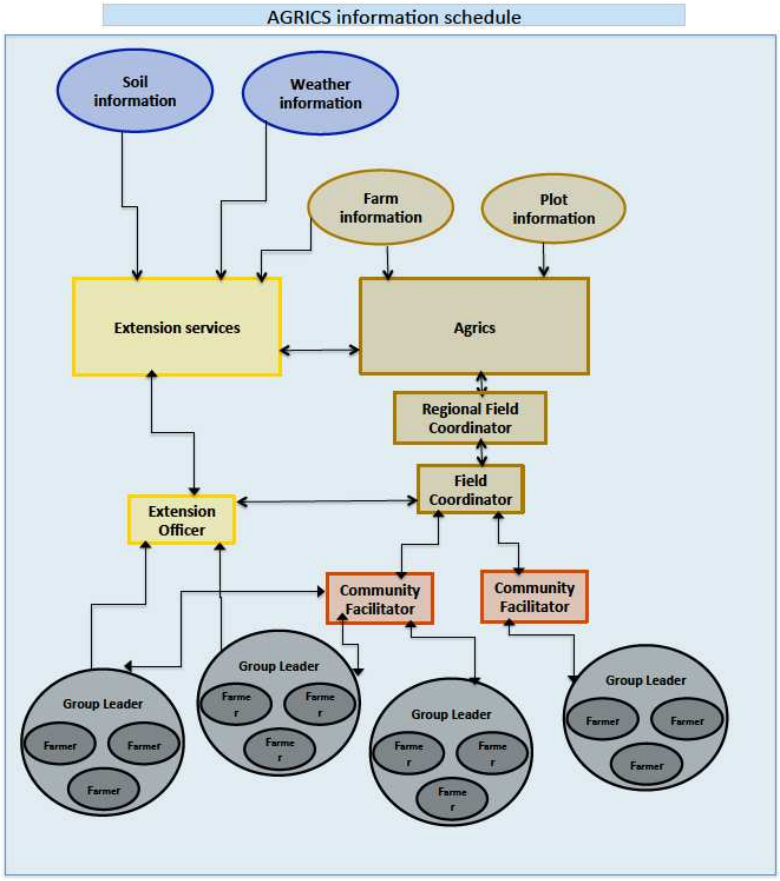


*Figure 3.1. Agrics information schedule.*

*Farmer Group (FG)*. A FG has 10 – 15 members who live in the same village; members work together in the field and attend weekly meetings. Each group chooses one of them as Group Leader (GL).

*Group Leader (GL).* Each farmer group provides a literate leader who attends weekly meetings. The GL is not an Agrics employee. Tasks of a group leader include: to enrol members, mobilizing group members for meetings, attend meetings and trainings, provide trainings to members, do a land evaluation, listen to members complaints and forward them to FC or CF.

In addition the GL keeps record of the repayment of the farmers in the group in a group passbook. The GL is responsible for collecting the repayments and passing the money on to the CF.

*Community Facilitator (CF).* The CF receives a monthly fee from Agrics and is the direct link with the FGs. The CF who invites farmers to a group is in most cases a farmer him/herself and is from the area. The CF keeps a CF passbook and transfers the repayments from the various farmer groups to Agrics. In Kenya, a CF works with up to 120 farmers, it is considered that 180 farmers is the maximum. Agrics Tanzania only recently started working with CFs. Not every village has a CF yet, and FGs in smaller villages are still managed by the FCs. The CFs are coordinated by a Field Coordinator (FC).

*Field Coordinator (FC)*. The FC coordinates the CFs and stays in close contact with them via phone. The FC pays regular visits to the villages for meetings with GL and individual farmers. These visits are mandatory in order to hear from farmers/group leaders on how the CF is doing and what is happening in the village. Besides this the FC is responsible to engage the CF during the months that recovery is not taking place, so that the CF prepares the village for the payment of the upcoming instalments. As explained in the paragraph above, Agrics Tanzania only recently started to work with CFs. Therefore there are also farmers who are directly contacted by the FC.

*Regional Field Coordinator (RFC).* The RFCs are part of the Agrics structure in Kenya due to the large number of farmers enrolled in the credit scheme. Presently one RFC coordinates three field coordinators.

### *Repayment and Quality check*

For payment of the credit the GL keeps record of the repayment of the farmers in the group in a group passbook. The GL is responsible for passing the money on to the CF or FC in some cases in Tanzania. The CF, in turn, keeps a CF passbook. All this information is compiled in the customer database at Agrics head office. The expected average credit repayment rate for 2016 is 95%. Currently (November 2015) Agrics Kenya has a repayment rate of rounded 90% and Agrics Tanzania of 62 %.

The following quality checks are presently in place:
- Customer care service: The farmer has a telephone number of Agrics customer care service. This desk can be contacted for inquiries or complaints. For Agrics Tanzania the customer care service still has to be organized.
- Farmer visits. The FC has regular meetings with GL and individual farmers to get their feedback on Agrics operations and functioning of CFs.

Agrics works in cooperation with provincial and county governments. The agricultural department collaborates with Agrics in giving advice to smallholder farmers. The community facilitators are not just trained by Agrics but also by agronomists who are employed by the county governments (Geodatics, 2015).

## *3.1 Agrics Kenya*

Agrics Kenya operates in Western Kenya in Busia, Kakamega and Bungoma Counties and facilitates farmer access to inputs through so-called "credit bundles" that include certified seeds, quality fertilizer, poultry, traction, grain storage bags and extension services. The main focus is on provision of inputs and the credit scheme. As presently only 40% of the farmers receive extension service, the Agrics management is working on improvement of this service.

### *Structure*

Agrics Kenya has its head office in Kakamega, Western Kenya and presently employs 35 permanent employees and over 85 field officers. In Annex 1 the organogram of Agrics Kenya is provided. The information schedule has been described earlier and is depicted in Figure 3.1.

In 2015 Agrics Kenya has been working in the following six regions: Kakamega North, Kakamega East, Busia, Butere, Bungoma and Siaya (Figure 3.2).

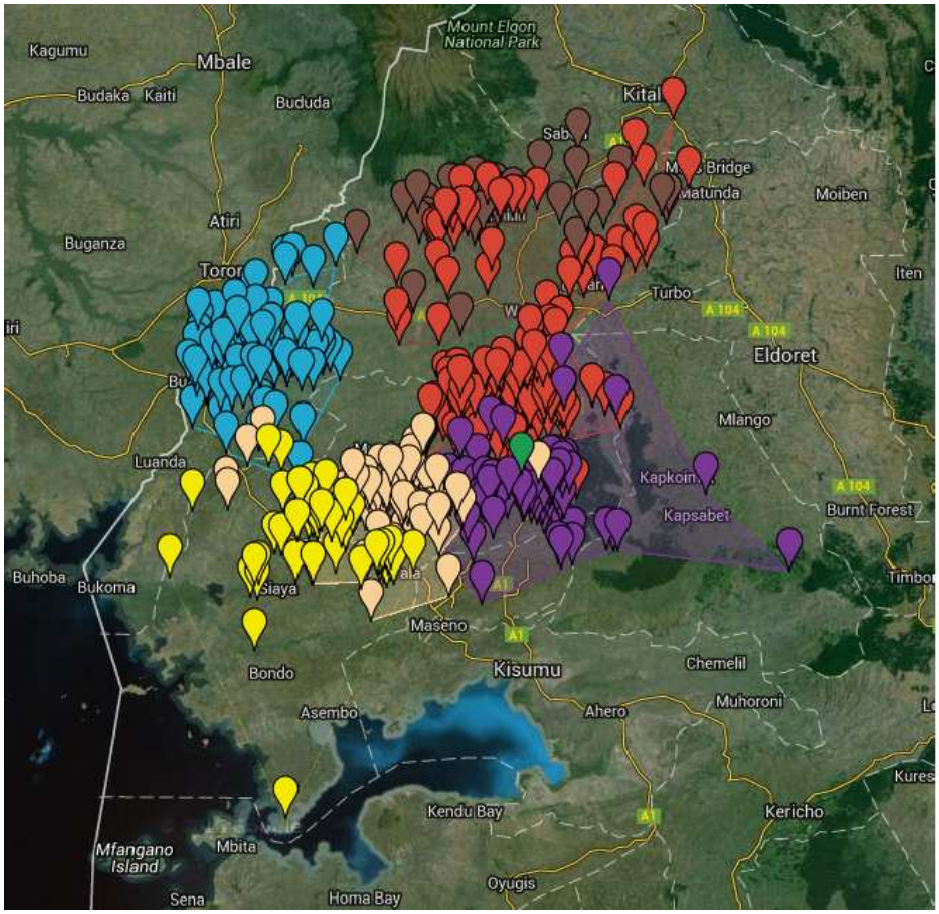


*Figure 3.2. Working area of Agrics Kenya; each marker is a village. Kakamega North (bright red); Kakamega East (purple); Busia (blue); Butere (beige); Bungoma (brown and red); Siaya (yellow). Head office is in Kakamega (green marker).*

The regions with best soils and highest rainfall are Kakamega North, Kakamega East and Bungoma. Farmers with larger areas are mainly found in the Northern part of Bungoma Region. In Kakamega North and East, where about 50% of Agrics farmers live, the land size planted with maize is small (Agrics, personal comm., 2015). The central warehouse of Agrics is in Butere, Butere region. Members are expected to carry their inputs home from the delivery points within their region.

In October 2015, Agrics Kenya served 9,779 farmers of which 60 % were female. The female farmers are generally very active in farming but do not sell the main cash crops on the market, as this is generally considered to be a man's job. These 9,779 farmers are organized in 864 groups that are represented by their Group Leader (GL). The CFs, 87 in total form the link with the farmer groups. There is 1 CF per sub-location. There are two regional field coordinators who are each responsible for three regions. Each region is headed by a field coordinator. An overview of Agrics Kenya is presented in Table 3.1 and the activities are presented in Table 3.2.

Table 3.1. Agrics Kenya (situation in October 2015).

| Function | Number | Remarks |
|---|---|---|
| Farmers (F) | 9,779 | 60 % female; 40% male |
| Farmer group (FG) | 864 | 10 – 15 members per group living within the same village; members work together and attend weekly meetings, trainings, planting and make payments. |
| Group leaders (GL) | 864 | Each farmer group provides a literate leader who attends weekly meetings, monitors members repayment and field progress |
| Community facilitators (CF) | 87 | 1 CF heads a sub-location<br>CF meets GL each week.<br>CF sees each farmer each 3 weeks. |
| Field coordinator (FC) | 6 | FC heads a region and is based at the regional office |
| Regional field coordinator (RFC) | 2 | RFC 1: Kakamega North, Bungoma, Busia<br>RFC 2: Kakamega East, Butere, Siaya |

Group Leader

The group leader (GL) keeps records of repayment by the farmers in a group passbook. The GL is responsible for passing the money on to the CF. The CF, in turn, keeps a CF passbook and brings the money to the M-Pesa[1] office. All this information is compiled in the customer database at Agrics Kakamega office. The expected average credit repayment rate from 2016 is 95%. Currently (November 2015) Agrics Kenya has a repayment rate of rounded 90%. It is planned for next year that the GL will send the money directly to Agrics without interference of the CF. This will be a pilot for 2016.

Table 3.2. Overview of activities of Agrics Kenya for the 2015-2016 season

| Activity | Period (months) |
|---|---|
| Registering (screening) farmers for next season | October, November, December (2015) |
| Negotiation with distributors | November (2015) |
| Preparing pricelist for famers | September (2015) |
| Contracting farmers | October, November, December (2015) |
| Purchasing inputs | November (2015), January (2016) |
| Distributing inputs to farmers | February (Last two weeks), March (2nd week) (2016) |
| Training to farmers | All year round (Depends on the training) |
| (P) Re payment moments by farmer<br>- upon ordering/signing contract 10%<br>- upon delivery of input 15%<br>- after harvest 25%, 25%, 25% | Prepayment of 10% needs to have been completed by January 2016 |
| Meeting farmer groups (leaders) by FC/CF | Group leaders meet CFs weekly.<br>CFs meet FCs weekly |

Community Facilitator (CF)

The CF has weekly meetings with the GL, and sees each farmer each three weeks and also informs farmers when the distribution of the inputs will be made. In Kenya, a CF works with up to 120 farmers, it is considered that 180 farmers is the maximum. The average education level of a CF is secondary school; mostly men have attended secondary school and women primary school.

[1] M-Pesa is a mobile money transfer service offered by Safaricom.

Field Coordinator (FC)
In 2015, Agrics Kenya has been working in the following regions: Kakamega North, Kakamega East, Busia, Butere, Bungoma and Siaya. All FCs are based at the regional office in the regions where they coordinate. A FC manages about 15 CFs and the FC stays in close contact with them via phone, as well as regular visit to these villages.

### *Language and communication*

In the area where Agrics operates several local languages are spoken. This implies that communication involves translation from English and/or Swahili to the local language. A potential risk is that mistakes are made in translations. Therefore the messages to farmers have to be as easy and as short as possible and preferably in English and Swahili

The (Regional) FC communicates with CFs, CF with GLs, and GL with their farmers. The FC also communicates directly with the farmers. Information is often shared by means of text messages. This can be at all levels, depending on the contents of the message that is sent to the CF or farmer. The CF for instance informs the farmers when the distribution will be made; an sms can be used to reinforce the information. The situation for 2015 is presented in Figure 3.3.

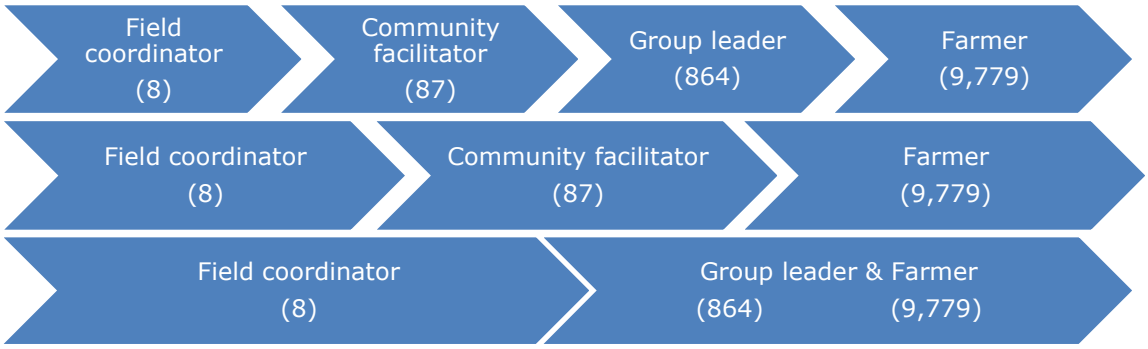


*Figure 3.3. Agrics Kenya: information flows to farmers. Numbers relate to the situation in October 2015. Note that the number of farmers includes the group leaders.*

### *Products*

Agrics' business model entails farmers enrolling in a credit scheme at group level. After receiving input for their farms, farmers make weekly repayments to Agrics Kenya with all remittances being made via mobile payment services. In addition to the core package of food production, farmers can purchase top up products related to livestock, traction, lighting and storage facilities (Agrics, 2015). In this report, we focus on the maize (seed, fertilizer, advice) package.

Seeds and fertilizers are offered in fixed combinations. Agrics offers 15 different types of hybrid maize seeds that are adapted to the regions. The smallest package offered is for 0.25 acre. A full package serving one acre, includes a basic gift of 50 kg of di-ammonium phosphate (DAP), a top dressing of 50 kg of calcium ammonium nitrate (CAN) and 10 kg of improved maize seeds. On a per hectare basis, this represents 125 kg of DAP and a similar amount of CAN which is equivalent of 55.6, 24.8 and 0 kg of nitrogen (N), phosphorus (P) and potassium, respectively (Table 3.3).

A similar package is available for beans, the major crop in the small rain period. A package of 4 kg of seeds and 6.25 kg DAP which will serve 0.25 acre[3] and costs KES[4] 1,700.

Table 3.3. Agrics Kenya, Core maize package.

| 2016 Core Package | | | | | |
|---|---|---|---|---|---|
| **Product** | **Unit** | **¼** | **½** | **¾** | **1** |
| Area covered | acre | 0.25 | 0.50 | 0.75 | 1.00 |
| Fertiliser DAP[a] | kg | 12.5 | 25 | 37.5 | 50 |
| Fertiliser CAN[b] | kg | 12.5 | 25 | 37.5 | 50 |
| Nitrogen application | kg/acre<br>kg/ha | 23<br>55.6 | 23<br>55.6 | 23<br>55.6 | 23<br>55.6 |
| Phosphorus application | kg/acre<br>kg/ha | 10<br>24.8 | 10<br>24.8 | 10<br>24.8 | 10<br>24.8 |
| Potassium application | kg/acre<br>kg/ha | 0<br>0 | 0<br>0 | 0<br>0 | 0<br>0 |
| Certified Maize Seeds | kg | 3 | 5 | 7.5 | 10[c] |
| **Total Cost** | **KES** | **3,450** | **6,200** | **8,850** | **11,550** |

[a]100 kg DAP contains 18 kg N and 20 kg P; [b]100 kg CAN contains 27 kg N; [c] equals 25 kg/ha

For the 2014 – 2015 season, 294.4 tonne of fertilizer and 59 tonne of maize seed were delivered. In 2015, 8,772 farmers had a so-called "maize bundle" with a total land size of 5,706 acres. The average land size for which the maize inputs are purchased is 0.65 acre (or 0.26 ha). Table 3.4 shows that in 2015 the majority (>75%) of farmers purchased inputs for an area of 0.5 acre. Farmers with the Agrics maize bundles have realized maize yields of 12 bags[5] per acre, an increase of 8 bags compared to farming without the Agrics inputs.

Table 3.4. Area size for which framers purchase maize inputs.

| **Area for which inputs are purchased (acre)** | **Number of farmers** | **%** |
|---|---|---|
| 0.5 | 6,700 | 76.6 |
| 1.0 | 1,704 | 19.5 |
| 1.5 | 133 | 1.5 |
| 2.0 | 174 | 2.0 |
| 2.5 | 7 | 0.1 |
| 3-10 | 31 | 0.4 |
| Total | 8,749 | 100 |

In Western Kenya, maize is grown in the long rainy season. An overview of a typical maize growing season is presented in Figure 3.4. Planting is done in February-March. DAP fertilizer is applied at time of sowing and CAN as top-up application after weeding, about 6 weeks after sowing.

Normally maize is grown as a pure stand (no intercropping), only some 5% of the farmers intercrop with beans (Agrics, personal comm., 2015). Cash crops are grown in the short season. In Kakamega regions, cash crops are mainly soy and sunflower; in Busia and Siaya regions farmers grow groundnut while onions and tomatoes are grown in Bungoma region.

[3] 1 acre = 0.4049 ha
[4] 100 KES is roughly equivalent to €0.85 (source: XE.com; accessed 12 October, 2015)
[5] 1 bag of maize is 90 kg

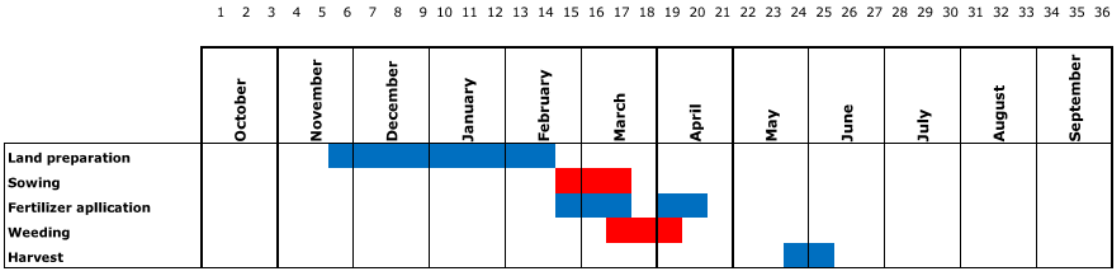


*Figure 3.4. Cropping calendar (decades) for maize cultivation in Western Kenya.*

## *Extension*

During the cropping season Agrics provides advice to the farmers through the community facilitators (Pictures 3.1 and 4.1). Presently, only 40% of the farmers receive extension service. It is the aim of Agrics to reach all Agrics customers. Additionally, extension and training officers go to the field to offer farmer trainings. In 2016, there will be also equipment to offer video based trainings to farmers. An overview of the advice for maize cultivation is presented in Annex 2. Table 3.5 provides a summary.

Table 3.5. Agrics advice for maize cropping – summary.

| Period | Advice on | Remarks |
|---|---|---|
| October | Maize seed choice: recommendation of variety | |
| Nov – Jan | Land preparation | 1st plough at least 8 wks before the start of the rains<br>2nd plough or harrow at the start of the rains<br>final plough/ 2nd harrow just before or at planting |
| Jan – Feb | Planting time (weather related) | Plant after it has rained 3 days in a row.<br>Spacing 75 cm between rows; 25 cm within row; depth 15 cm. 1 seed per hole |
| | 1st fertilizer application at sowing | One (red) scoop of DAP per hole |
| March – April | Weeding | 1st and 2nd weeding before applying top dressing |
| | Top dressing | 1st when maize plants are knee-high<br>2nd when maize plants are shoulder high<br>Use CAN fertilizer with (Agrics) scoop<br>Apply as instructed by CF |
| May - June | Harvest &<br>Post harvest handling | |

Source: ICS, 2015.

Agrics Kenya has presently 4 demonstration plots and it is the ambition to increase this number to 6 or 7, in order to have 1 demonstration plot in each of the 6 regions. The Agrics Research and Extension Officer oversees the demonstration plots. This includes experiments with different seed types and the performance of the seed with different fertilizer quantities.

The CFs are not just trained by Agrics but also trained (though not intensively) by agronomists who are employed by the county governments. These trainings are not structural trainings provided by the government. In the past Agrics made arrangements with the agricultural college where some of the CFs went for trainings that were paid for. The CFs provide training to GLs. This is not organized in a structured way. The CF gives advice to GLs on topics following the field activities (eg on sowing or weeding).

## 3.2 Agrics Tanzania

Agrics Tanzania operates in Northern Tanzania and facilitates farmer access to inputs including certified seeds, quality fertilizer and extension services. Throughout the season, Agrics officers provide extension support to ensure that the farmers get maximum return on their investment toward better yields (Agrics, 2015).

### *Structure*

Agrics Tanzania has its head office in Shinyanga and operates in Northern Tanzania in the districts of Maswa, Meatu and Shinyanga rural. The map in Figure 3.5 shows the villages in which Agrics Tanzania has distributed inputs for the 2015-2016 season.

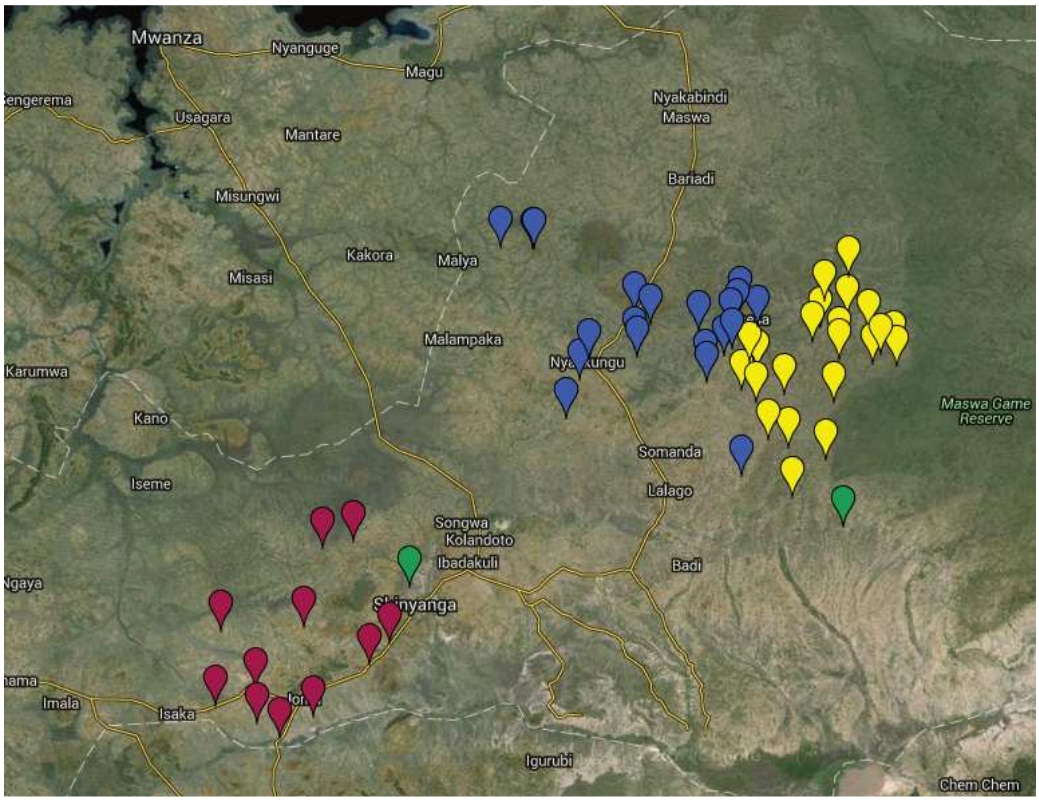


*Figure 3.5. Working area of Agrics Tanzania. Each marker is a village. Shinyanga Rural (red); Maswa (blue); Meatu (yellow). Agrics offices (green marker).*

When Agrics started their operations in Tanzania they made use of the existing Community Based Organizations (CBO) that are present in each village. Orders for inputs were coordinated by the CBO that distributed the inputs to the farmers. The system turned out to be less transparent and functional for the repayment of the credit; and as the farmers were not registered with an Agrics structure is was difficult to follow up the repayment. For this reason Agrics Tanzania is reorganizing the structure towards the structure described earlier (Figure 3.1.) and is presently in a period of transition.

In November 2015, Agrics Tanzania served 3,724 farmers, organized in 267 groups that are represented by their Group Leader (GL). The CFs, (19) and FCs (4) form the link with the

farmer groups (FGs). Goal for the next season (2016/2017) is to reach 8,500 farmers adding Geita district to the working area. An overview of Agrics Tanzania is presented in Table 3.6 and the activities are presented in table 3.7.

Table 3.6. Agrics Tanzania (Situation, December 2015).

| **Function** | **Number** | **Remarks** |
|---|---|---|
| Farmers (F) | 3,724 | These are only the farmers that have registered under contract for credit sales. It is estimated that the total number of farmers will be around 3500 (including cash sales farmers) |
| Farmer group (FG) | 267 | 10 – 15 members per group living within the same village; members work together and attend weekly meetings, trainings, planting and make payments. |
| Group leaders (GL) | 267 | Every group has a leader |
| Community facilitators (CF) | 19 | 15 structural CF's and 4 temporary CF's, see explanation below |
| Field coordinator (FC) | 4 | One in every area; Maswa (21 villages), Shinyanga Rural (11 villages) and Meatu (19 villages) |

Agrics Tanzania recently started working with CFs. Therefore, not every village has a CF yet, and smaller villages are still managed by the field FCs. The number off villages and groups in Shinyanga is manageable for 1 FC. In addition to "structural" CFs there are also temporary CFs who are in place during the distribution period, in villages where inputs are sold on cash and the cash sales farmers also need to be registered. This process needs extra support and since the FCs cannot facilitate all villages at the same time, these CFs are put in place. They are paid based on the number of quantities they handle; 100 TZS per sold kg. These temporary CFs can become structural CFs if they mobilize farmers in their villages to become Agrics clients for the coming season. For these CFs it is an opportunity to secure a more structural job, while for Agrics it is a great way of marketing as well as building trust within the villages.

Presently there are 4 FCs, each supervising 4 CFs at average. For the coming year there will be 2 extra CFs for the new locations Geita and Kahama. The number of farmers under the CF depends on credit portfolio. It is possible that a CF is serving 45 farmers in one village for example. From the 15 structural CFs there are 8 with more than 100 farmers. Reaching all their farmers once every two weeks at least must be possible for one CF.

The level of education of CFs varies but average is primary school. Till Age 12- 13 years they go to school.

Table 3.7. Overview of activities of Agrics Tanzania.

| **Activity** | **Period** |
|---|---|
| Registering (screening) farmers for next season | February – July (on-going) |
| Negotiation with distributors | July - August |
| Preparing pricelist for famers | August |
| Contracting farmers | August - September |
| Purchasing inputs | September |
| Distributing inputs to farmers | October |
| Training to farmers | October – November, February-March |
| (P)Re payment moments by farmer<br>- upon ordering/signing contract 10%<br>- upon delivery of input 15%<br>- after harvest 25%, 25%, 25% | <br>September<br>October<br>April, May and June |
| Meeting farmer groups (leaders) by FC/CF | At least once every 2 weeks (on-going) |

### *Language and communication*

All the farmers understand Swahili, or even speak it. The use of sms-messages is not part of current information flow. The FC communicates with CFs, CF with GLs, GL with farmers. The CFs and FCs also speak to farmers directly. Not all villages have a CF yet. In that case the FC manages the village. The situation for 2015 is presented in Figure 3.6.

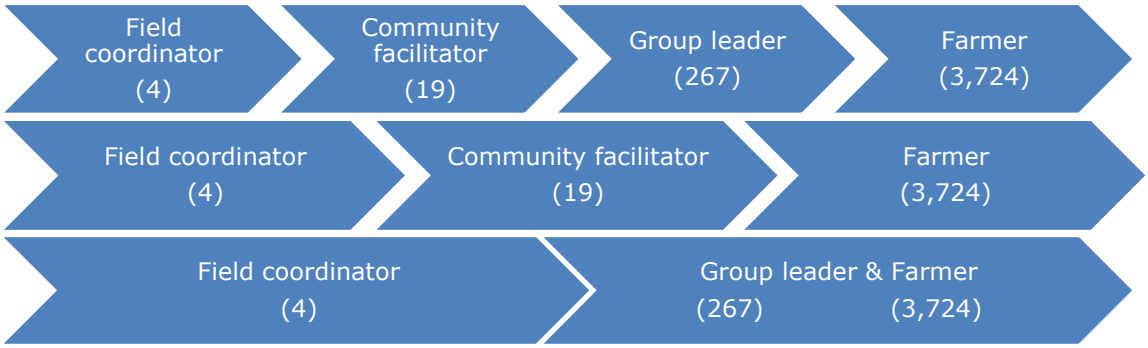


*Figure 3.6. Agrics Tanzania: information flows to farmers. Numbers relate to the situation in November 2015. Note that the number of farmers includes the group leaders.*

### *Products*

In Tanzania farmers are very reluctant to use chemical fertilizer hence it is not part of the input package. Agrics Tanzania offers maize and sunflower seeds and CAN-fertilizer. Farmers can order what they want, up to a maximum of 750.000 TZS[6] per person. Table 3.8 provides an overview of the inputs available for the season 2015/2016, as well as the sales price per unit.

Table 3.8. Agrics Tanzania: package 2015/2016.

| | **Input** | **Unit** | **Sales price** |
|---|---|---|---|
| Maize | SeedCo Pundamilia | kg | TZS 6,900 |
| Maize | SeedCo Tumbili | kg | TZS 6,900 |
| Maize | Pannar | kg | TZS 5,900 |
| Maize | Faru | kg | TZS 5,900 |
| Sunflower | Kenya Fedha | kg | TZS 5,500 |
| Fertilizer | CAN | bag (50 kg) | TZS 70,000 |

Because of the new structure of pre-payment and payment in instalments, sales are offered on credit or on cash. Sales on cash is mainly for the farmers whom were too reluctant to pre-pay any money without getting the seeds in their hands upon the moment of paying. A summary of the sales of the 2014-2015 season is presented in Table 3.9. Agrics Tanzania estimates that nearly 98 % of the farmers purchases inputs for maize cultivation and 7 % for sunflower cultivation.

[6] 1,000 TZS is roughly equivalent to €2.80 (source: XE.com; accessed 15 October, 2015)

Table 3.9. Summary of products that have been sold in the 2014 - 2015 season.

| | Input | Unit | Sold per contract (kg) | Cash sales (kg) | Total (kg) |
|---|---|---|---|---|---|
| Maize | SeedCo Pundamilia | kg | 13,824 | 9,238 | 23,062 |
| Maize | SeedCo Tumbili | kg | 6,092 | 4,458 | 10,550 |
| Maize | Pannar | kg | 4,610 | 1,390 | 6,000 |
| Maize | Faru | kg | 2,372 | 0 | 2,372 |
| Sunflower | Kenya Fedha (Sunflo-wer) | kg | 620 | 0 | 620 |
| Fertilizer | CAN | kg | 5,150 | 500 | 5,650 |

Source: Agrics Tanzania (personal communication, 2015)

In Northern Tanzania there is one growing season. Farmers grow maize often inter cropped with beans and green gram and sometimes cotton. The number of farmers using fertilizers is low. This is due to low confidence in product providers and farmer's belief that using fertilizer is negatively affecting the soil in the future. Those farmers who use fertilizers do not apply it at sowing but after about 6 weeks. Organic fertilizer products are accepted but not yet widely used. An overview of a typical maize growing season is presented in Figure 3.7.

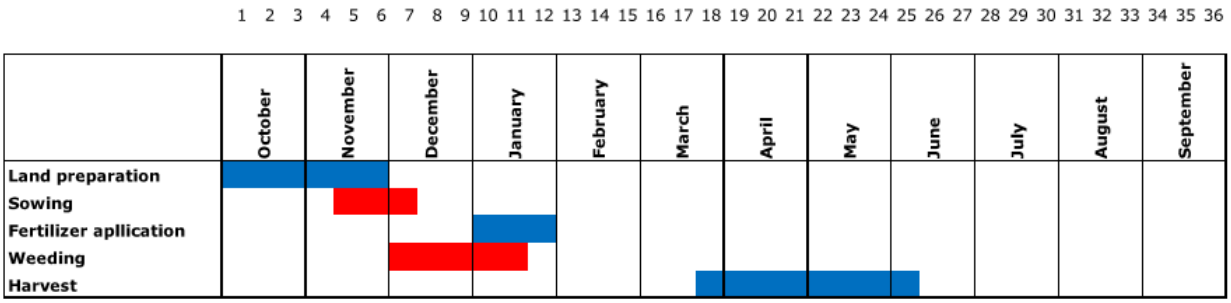


*Figure 3.7. Cropping calendar (decades) for maize cultivation, Tanzania.*

Information on sunflower cultivation is presented in Figure 3.8. Sunflower is normally cultivated as pure stand and without fertilizer application.

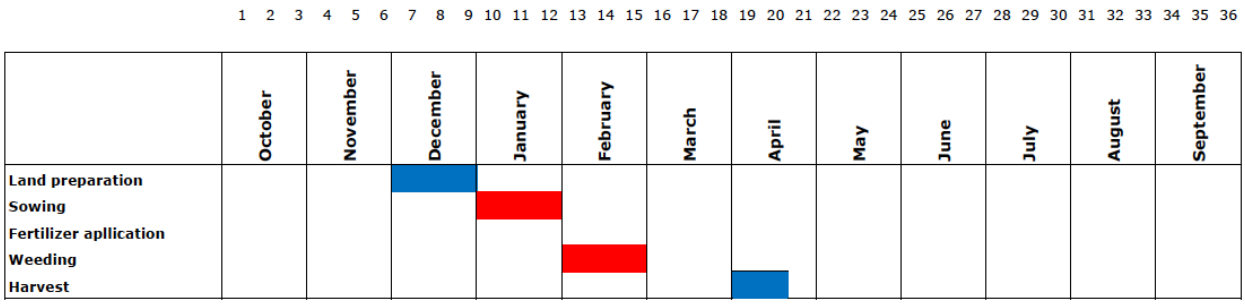


*Figure 3.8. Cropping calendar (decades) for sunflower cultivation, Tanzania.*

### *Extension*

The extension service of Agrics Tanzania covers the same topics as Agrics Kenya, though Agrics Tanzania does not have their own specific training material. The traditional way is via farmer field school days. Farmers come together and learn about new topics. The FC or the owner of the farm is then training the farmers. Additional training is provided to farmers (by the use of trainers of trainers) by agricultural officers from the government in consultation with Agrics' agronomist. The Agrics agronomist is then supposed to follow up with the farmers (also through the field coordinators).

Demonstration plots

In December 2015 there were five demonstration plots. In Maswa area and Meatu area two demonstration plots have been realized and in Shinyanga Rural there is one plot. For 2016 it is planned to have additional demonstration plots in the new areas.

*Picture 3.1. Agrics extension meeting.*
*Source: Agrics Kenya.*

## 3.3 Data management

Agrics keeps a customer database in which the inputs that are requested, credit and repayment are recorded. Record keeping is focused on loan and repayment. An overview of Agrics data sources are presented in Table 3.10.

Farmers who are members of a farmers' group and buy on credit have a *Farmer passbook*. In this passbook the following information is recorded: Agrics ID; name, sub-location, group and telephone number of the CF; the packages that have been chosen and the required credit; repayment of the credit. The group leader keeps record of the repayment of the farmers in the group in a group passbook. The group leader is responsible for passing the money on to CF. The CF, in turn, keeps a CF passbook. All this information is compiled in the customer database at the national Agrics head office.

The information that is presently collected by Agrics includes farmer information (customer registration: personal data and progress in repayment), and plot information (acreage that inputs are purchased for).

Table 3.10. Overview Agrics data sources, type of data and end product.

| | **Name** | **Description** | **End product** |
|---|---|---|---|
| | **AGRICS** | **Farm and region** | |
| 1 | "Agrics customer database" | Records of farmers' personal data and progress in repayment.<br>Privacy sensitive information.<br>Agrics Kenya: an access database is replaced by a Roster database<br>Agrics Tanzania uses an excel database. | Text files<br>"numeric" files |
| 2 | Logistics | Availability and delivery of seeds and other Agrics products | Message to farmer to inform where and when to collect products/services. |

According to the ICS Training package, group leaders are to make a land evaluation for each of the group members. To this end the group leader has to make an estimation of the land quality based on soil fertility, drainage, slope, occurrence of weeds and plot history for pests and diseases. In practice a land evaluation consists of questions from the GL to farmers, such as: Does a farmer have many trees? Is the land viable? Is the place rocky? Water availability? Incline? Farmers may choose to continue or look for other parcels based on the discussion with the GL. The land evaluation worksheet is included in Annex 2. It still has to be checked with Agrics staff to what extent these evaluations have been done or that they are planned for future improvement of advice.

# 4. CONCLUSION

There is a clear need for private initiatives that can complement existing public extension systems in countries like Kenya and Tanzania where data availability for farm advice still is limited. In both countries, public involvement in extension services has seen a number of changes. Basically, three models working synchronously, i.e. public extension services, commodity oriented public services and private organizations including Agrics. Performance and success rates of each of the models are difficult to assess.

Special attention is needed for the harmonization of approaches and methods in demand-driven extension and capacity building of grassroots institutions as a way to help adress institutional weaknesses in capacity building and technology development and dissemination in Africa. This requires the creation of institutional frameworks that can coordinate and provide linkages among stakeholders involved in the provision of extension facilitating factors (Government of Kenya, 2012).

Agrics Kenya and Agrics Tanzania serve as private initiatives addressing the need to develop institutional capacity and technology dissemination frameworks. They are working in a more or less similar way, although regional differences occur. Integration with existing public and other service providers has not yet been fully assessed in this report and further data collection in this field remains crucial.

The potential for integrated use of ICT and mobile technology in the Agrics model is obvious but remains to be further investigated. IFPRI (2015b) identifies a large potential for cross-sectorial collaboration on information channels, products, and services, with ICT complementing other extension and knowledge services. Realisation of this potential will require a solid and more detailed description of the way farmers are currently accessing and sharing information. This is subject of further research in the Geodatics project.

It should be stressed, however, that integration of existing data management in an extended information system offers both opportunities and challenges. On the one hand, it allows integration of additional data sources including satellite images and insights including scientific knowledge base developed by partners including WUR. It also provides an opening towards an extended integration of online data collection and analysis and mobile service provision.

On the other hand, enhanced integration of data sources including information on farm participation in Agrics programmes and repayment data will require specific actions to provide sufficient protection of private and sensitive information.

Options for the development of a data and information system model will be discussed in a separate report which will provide an assessment of opportunities and threats in the context of the Geodatics project.

*Picture 4.1. Agrics extension activities in the field.*
*Source: Agrics Kenya.*

# REFERENCES


Agrics, 2015. http://www.agrics.org/home/ . Accessed 28 Oct. 2015

Deschamps-Laporte, J.Ph., 2013. The impact of extension services on farming households in Western Kenya. A propensity score approach. Örebro, Sweden, Örebro University School of Business.

Geodatics, 2015. Project Plan – Full proposal (for Application) Geodata for Agriculture and Water Facility (G4AW)

Government of Kenya, 2012. National Agricultural Sector Extension Policy (NASEP). Agricultural Sector Coordination Unit (ASCU), Nairobi, Kenya.

ICS, 2015. 2015 – Training Packet

IFPRI, 2015a. Kenya country profile. http://www.worldwide-extension.org/africa/kenya Accessed 14 November, 2015

IFPRI, 2015b. A Brief History of Public Extension Policies, Resources and Advisory Activities in Tanzania. http://www.worldwide-extension.org/africa/tanzania/s-tanzania Accessed 14 November, 2015

Muyanga, M. and Jayne, T. S., 2006 Agricultural extension in Kenya: practice and policy lessons. Nairobi, Tegemeo Institute of Agricultural Policy and Development, Egerton University

# ANNEX I AGRICS KENYA ORGANOGRAM

# ANNEX II AGRICS KENYA – CURRENT ADVICE

Source: ICS, 2015

**GROUP LEADERS: LAND EVALUATION TRAINING**
**OBJECTVES:** Train group leaders in effective land evaluation techniques and Empower group leaders to lead land evaluation in their groups and to take ownership of this process.

**Purpose of land evaluation**
- The group leader checks the land size and the quality of each of their member's field.

**LAND CHECK**
Evaluation takes place in the field to observe the overall quality of the land by interviewing the member
Consider
- Soil fertility – if there is not any or is not much vegetation, then soil fertility is low
- Drainage – flooding - if there is a low area at the center of the field this area may flood.
- Ask the member if there is ever standing water during the long rains
- Slope- observe if the slope of the field is very steep and if the top layer of soil would run off if there are rains.
- Weeds/ striga - observe if there is a high density of striga weed and ask the member about the history of stiga weed on their field.
- Severe striga- is 3 plants in $5m^2$ area and mild striga- is 1 plant in $5m^2$ area
- Pests/ Diseases – ask the member if there is a regular history of problems with pests or plant diseases.

The following definition of good land is applied:
- Good land has a good history of production
- Good land is not swampy and does not have rocky soils
- Good land does not have a steep slope
- Good land is not overrun with striga weed or pests
- Good land is the right size for the land enrolled with community facilitator

Fields are qualified as good, medium, or poor quality land.

Field qualified as: as **poor quality** or poor soil fertility or slope/ drainage or severe weeds/ pests.

Advise the member not to plant on that field if you find the soil very infertile or find severe flooding, slope, striga weed, and problems with pests in the past, or shading.

- Problem – solve with this member: what alternatives are available? Does this member have access to another piece of higher quality land? Can this member lease land for the season e.t.c.?

- If you find **medium quality land**, advise the member on effective land preparation techniques to address each problem as listed under "land preparation" on your tool.
- List the current seed choice and identify particular land concerns listed under 'seed selection' on your tool.
- Use this information to identify which type of maize to use – early, medium, or long maturity.

**Choice of Maize seed**
Basic recommendations when choosing a seed type:
- Areas with striga or have less rainfall, select from the short maturity varieties such as – Pannar 4M-19, DK8031, Duma 43, KSSP 94 and western 403. These varieties have some drought tolerant.
- Areas with average rainfall, select from the medium maturity varieties such as Simba 61, Western 505 and 507, Kenya seed 513 and 516,
- Areas with lots of rainfall and highlands, select long maturity varieties such as Kenya seed 614 and 6210, Tembo 73 and Pannar 691.

None of these seeds will do well in swampy low or very steep lands. These will be poor investments.

**LAND EVALUATION TRAINING**

**(WORK SHEET) GROUP LEADER EVALUATION GUIDE**

| | |
|---|---|
| Site:<br>Group<br>Group Leader / Evaluator: | Member name:<br>Land size Enrolled:<br>GL recommendation: |

**Overall, what is the quality of the farmers land?**

- Good quality
- Medium quality
- Poor Quality (concern)
  Severe problem

**What land quality challenges exist**

| | | | |
|---|---|---|---|
| Soil Fertility | Good | Medium | Poor |
| Slope/ Drainage | Good | Medium | Poor |
| Weeds / Pests: | None | Mild | |

Land indicated as poor quality (concern)? - If group leader indicates poor quality (concern), visit that field yourself

| **Do not** plant | Land preparation |
|---|---|
| Very infertile soil | Mild striga - plough thoroughly and add compost |
| Severe slope | Low / weak soil fertility n- add compost |
| Severe stiga weed | Water logging – dig trenches |
| Severe problems with pests in the pasts | Steep slope – plough across slope |
| Severe shading | Steep slope – plough across slope |

Current seed choice: _____ seed choice change recommended?

| **SEED SELECTION :** | **Maturity type Recommended** |
|---|---|
| ❖ Mild striga – short maturity Seed type recommended | Long maturity |
| ❖ Rocky / Sandy soil – short maturity. | Medium Maturity |
| ❖ Low /medium Average Rain – Short maturity | Early Maturity |

**LAND CHECK TOOL (TO COMPLETE)**

**TOTAL LAND AREA**:

**Extra Land Available?** = If extra Land is available, visit that member and encourage them to increase their acreage with ICS.

**Notes / Tasks / Comments / Feedback**

**Use of the Calendar of crop**

| Week of (date) | MAIZE | BEAN |
|---|---|---|
| | Planting | Planting |
| | Planting | Planting |
| | Planting | Planting |
| | Weeding/Top dress | Weeding |
| | Weeding/Top dress | Weeding |
| | Weeding/Top dress | Weeding |
| | Top dressing | |
| | 2nd Weeding/ 2nd Top dress | |
| | 2nd Weeding/ 2nd Top dress | |
| | 2nd Weeding/ 2nd Top dress | |
| | 2nd Top dress | |
| | | |
| | | Harvesting |
| | | Harvesting |
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| | Harvesting | |
| | Harvesting | |

***Land Preparation***

**Ploughing Instructions:**

1. You should do a first plough at least 8 weeks before the rains start to turn over the soil
- This helps remove weeds, pests & diseases from the soil and breaks the hard surface
- We recommend to plough 8 weeks before planting as weed seeds can up to 8 weeks to emerge
- You should plough as deep as a large, new jembe blade (*preferably deeper*) or use the tractor option.
- If you don't do the first plough you will have to work harder to remove weeds through the Long Rains!

2. You should do a second plough *(called a harrow)* immediately when the rains begin to break down the soil into a fine seedbed
- You should break down any large clods (chunks) of soil
- You should wait at least three days after the second plough before planting

3. You should do a final plough (*2nd harrow)* just before or at planting to make the soil as fine and flat as possible

**Manure and Compost**

a. If you have been saving manure or compost do NOT mix it into the soil when you are ploughing

b. ICS will teach you how to apply manure and compost directly during planting training.

c. This technique will give you bigger harvests because the plants will use the compost and manure more Effectively

***Planting time***

- The best time to plant is in the evening or morning, when the soil is wet
- You should **not** plant until it has rained for 3 days in a row!
- We check the KARI weather reports and will let you know the best time to start planting

Seed spacing:
**Maize -** 75 cm by 25 cm

The maize planting string should have black marks every 25cm

- Planting hole; Check your hole is deep about 15cms.
- one heaped RED scoop of DAP fertilizer in the bottom of the hole
- Fill the hole halfway with soil
- Make sure the fertilizer is completely covered
- If you have prepared dry manure or compost you should cover the fertilizer with them instead of soil!
- Do NOT use fresh manure as this can damage the seed!

- Place ONE maize seed in the half□filled hole
- Fill in the rest of the hole completely with soil

**Weeding**

Weeds grow quickly and eat nutrients in the soil. They take sunlight and water away from your plants
- Weeds can also spread disease and provide a home for pests.
- Most importantly, you must weed before you apply top dress fertilizer
- If you apply top dress before weeding, the weeds will steal the fertilizer you have worked hard to purchase!

Remove weeds and their roots from the field and burn them

Ensure that you dig deep and remove all the weeds' roots.

**4. Top Dress Timing**
- Planting fertilizer helps the plant develop strong roots
- Top dress fertilizer helps the plant to develop strong leaves and a healthy stalk and cob
- Top dress fertilizer creates big harvests!
- ICS farmers apply top dress to maize TWICE:
  1. The first time is when the maize plants are knee□high
  2. The second time is when the maize is shoulder□high

It is important to apply top dress to maize **twice** because the rain can wash the top dress fertilizer away before your maize has a chance to use it all

You need to weed your maize before you begin top dressing!!

**Making the Top Dress Hole**

- Place the tip of the nail at the stem of the maize plant
- Insert the stick into the ground until the nail touches the soil
- Be gentle – you don't want to damage any of the roots or disturb the plant!
- DO NOT let the sharp end of the nail touch the plant!

**Applying and Covering the Fertilizer**

- For maize, you should top dress with CAN fertilizer
- For each maize plant, you only need ONE CLEAR fertilizer scoop

**Cover** the fertilizer with soil to prevent the rain from washing it away

**Pest and Diseases**

Two cheapest ways to prevent pests and disease? (*Weeding at correct times and removing and burning infected plants!)*

**Striga**

Striga is a weed with purple flowers
The only way to control the Striga weed is to remove the weed as soon as it appears

**Maize**
**Stemborers**

Stemborers are small caterpillars that can affect maize, sorghum and millet
The early signs of stemborers are small holes in straight lines across the newest leaves
You should treat the stemborers before the caterpillars move into the stem
You can plant napier grass around your crop – this will attract and trap the caterpillars

**Pests and Diseases Training**

· _The Ash / Pepper recipe below can provide some protection from a large variety of pests that carry many disease including Aphids that affect Sukuma Wiki and Beans

To scare off the birds: Use *reflectors, plastic bags, stones, making noise!*