

Going for hybrid maize: the importance of land for the success of maize crop insurance in Tanzania

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Abstract: The importance of land for the success of maize crop insurance in Tanzania

Climate change and the resulting increased drought periods contribute to farmers' problems in Tanzania, but their core problem is low agricultural productivity. Local extension services are not functioning properly, while farmers need to move from traditional to hybrid seeds to assure food security. A non-commercial private sector initiative is helping them by providing crop insurance. Between 2011 and 2014, the Swiss Capacity Building Facility (SCBF), a non-governmental organization (NGO) financed by ten Swiss insurance companies, funded four projects in Tanzania aiming to introduce crop insurances for maize farmers in the Iringa, Mwanza and Arusha regions. Land is an important asset for these farmers and our study analyzes the role of land, owned or leased and the prices paid for land. The impact of the size of the holdings was analyzed, showing that there is something like a land market in Tanzania and that the bigger farmers benefit relatively more of the opportunity to get inputs and insure themselves for crop failure.

Crop insurance is a frugal innovation (using existing technology), helping small maize farmers in Tanzania to make a step towards a green revolution, another innovation in Africa. Not only additional agricultural services were provided through this programme, also new technological options were used to reach as many farmers as possible at minimum cost. The project used a Weather Index Insurance (WII) based on satellite images to determine whether drought prevailed in the area concerned during the seeding, germination or ripening period. If the signal is less rain than normal, the farmers are compensated for the damage. Farmers can insure as little as one bag of hybrid seed bought from the seed company (SeedCo, covering only the germination period), or through signing up for a package for one acre of land through an NGO, or a commercial intermediary working together with a local NGO. The training projects were carried out by Acre Africa (AA), an international NGO, with a local affiliate (Acre Tanzania). The project contributed to the training of thousands of farmers in the three regions studied. In total more than 20,000 farmers are insured in the Iringa region and more than 10,000 in the Mwanza and Arusha regions taken together. The research identified the importance of land for the success of crop insurance for maize farmers in Tanzania.

To assess the impact of land and a Weather Index Insurance for Tanzanian maize farmers a survey has been undertaken by the author and his colleagues in the Arusha, the Mwanza and Iringa regions. In total 200 farmers were interviewed, using cluster sampling with the villages as sampling units and then selecting farmers' households per village as random as possible. The objective is to analyze the impact of the crop insurance introduced with the support of SCBF and its effect on household's income and assets and on agricultural productivity.

Three ways of supplying insurance are compared and the farmers supported by a local NGO, the One Acre Fund (1AF) show the best results, proving that insurance is in particular useful if it is embedded in an institutional support structure that is non-commercial and close to the farmers and not by using a profit oriented intermediary (Seedcos), or a combination of

a commercial and non-commercial organization. All three modalities insure the final risks with a local commercial insurance company (UAP) and the Swiss re-insurance company.

Most farmers do not know how much they pay for the insurance, but they are generally positive about it, since the insurance offers a feeling of security and the intermediary organizations reduce the loan in case of a crisis. However, some farmers were critical because no payments were made despite limited rains, or the payouts were too low. They want support to find better markets for their produce and more transparency concerning payouts.

The results of the survey are analyzed to better understand their problems and the effects of insurance. Positive effects were found comparing data for the first and the second year. The project is relevant and had impact. Besides indicators of the impact, also the outreach, efficiency and effectiveness of the interventions are analyzed and positive evidence is found. The impact of the size of the land of the farmers was analyzed, showing that there is something like a land market in Tanzania and that the bigger farmers benefit relatively more of the opportunity to get inputs and insure themselves for crop failure.

Supporting the transition from using traditional to hybrid seeds is recommended to modernize agriculture, to increase rural incomes and food supply. Land markets play an increasing important role and their functioning should be facilitated. For providing crop insurance it is important to select the intermediary carefully and to consider crop insurance as part of support package which should also include fertilizers and additional inputs like pesticides and access to water. There is also unsatisfied demand for insurance to be covered: from other regions, for other crops, for more land and for additional risks (like the damage due to caterpillars). More information and training should be provided to farmers and the insurance process needs to be made more transparent. The complaints of farmers should be taken seriously. SCBF should consider consultations with the government, to ensure support for crop insurances and facilitate the various steps to increase productivity of farmers, of which providing insurance is an important part. The challenge is to come to scale and break-even with this private sector initiative, which has helped farmers to run risks and become more entrepreneurial, buying or leasing additional land to increase their income.

Introduction

What is the best way to help traditional small scale maize farmers in Tanzania to increase their production? Due to climate change droughts occur more frequently contributing to farmers' risks, but the core problem is low agricultural productivity. Local extension services are not functioning properly, while farmers are still using traditional seeds instead of hybrid seeds, which could contribute to achieving food security in the country. A non-commercial private sector initiative is helping these farmers by providing crop insurance. Between 2011 and 2014, the Swiss Capacity Building Facility (SCBF), a non-governmental organization (NGO) financed by ten Swiss insurance companies, funded four projects in Tanzania aiming to introduce crop insurances for maize farmers in the Iringa, Mwanza and Arusha regions. The financial education and product upscaling were carried out by ACRE Africa (AA) with local partners like the One Acre Fund (1AF), a non-profit organization that supplies smallholder farmers in East Africa with asset-based financing and agriculture training services to reduce hunger and poverty and the seed company of Tanzania, SeedCo. ACRE Africa is not an insurance company, but rather a service provider working with local insurers and other stakeholders in the agricultural insurance value chain.

No real new technological options were introduced to reach as many farmers as possible at minimum cost. The project used a Weather Index Insurance (WII) based on satellite images to determine whether drought prevailed in the area concerned during the seeding, germination or ripening period and mobile telephones to communicate with the farmers. If the satellite signals less rain than normal, the farmers registered through their mobile phones

are compensated for the damage, ideally by topping up the amount available for calling or making mobile phone payments. This is a frugal innovation, in particular because farmers can insure as little as one bag of hybrid seed bought from the seed company (SeedCo), covering only the germination period), or through signing up for a package for one acre of land through an NGO, or a commercial intermediary working together with a local NGO.

The training projects were carried out by Acre Africa (AA), an international NGO, with a local affiliate (Acre Tanzania). The project contributed to the training of thousands of farmers in the three regions studied. In total more than 20,000 farmers are insured in the Iringa region and more than 10,000 in the Mwanza and Arusha regions taken together.

Research Methodology

To assess the outcomes of a Weather Index Insurance for Tanzanian maize farmers a survey was undertaken by the author in the Arusha, Mwanza and Iringa regions. In each region a random sample of farmers was interviewed. In total 200 farmers were interviewed, using cluster sampling with the villages as sampling units and then selecting farmers' households per village as random as possible. The objective is to analyze the impact of the crop insurance introduced with the support of SCBF and its effect on household's income and assets and on agricultural productivity.

Three ways of supplying insurance are compared and the farmers supported by a local NGO, the One Acre Fund (1AF) show the best results, proving that insurance is in particular useful if it is embedded in an institutional support structure that is non-commercial and close to the farmers and not by using a profit oriented intermediary (SeedCo), or a combination of a commercial and non-commercial organization. All three modalities insure the final risks with a local commercial insurance company (UAP) and the Swiss re-insurance company.

The study analyses the implementation of SCBF's funded activities in Tanzania at the sector, institutional and farmers' levels. Mixed (qualitative and quantitative) methods were used, with the emphasis on a quantitative survey in three regions in Tanzania. The research question was: *What is the impact of weather-based agricultural insurance on maize farmers in Tanzania? Are these farmers satisfied with the crop insurance product that is currently available to them?*

The first two levels of analysis involved desk research as well as open interviews with stakeholders such as for example 1AF, SeedCo and Airtel. The client level analysis was carried out through a customer survey and in-depth semi-structured qualitative interviews with farmers and key stakeholders. Between January and April 2018, the research team conducted in total 200 interviews with 80 female and 120 male maize farmers.

Geographic Area Selection Criteria and Data Collection

A representative sample of villages was drawn. Subsequently farmers' households were selected as random as possible in these villages. The research had a geographical focus; originally on the Arusha and Iringa regions where most farmers benefiting from the crop insurance are located, later the Mwanza region was added for practical reasons. During the fieldwork it turned out to be difficult to find enough cases in the Arusha region, where Acre Tanzania (AT) and UAP had started only a year ago, and hence the team moved to the Mwanza region, where SeedCo is active in providing hybrid seed with a germination cover.

For the purpose of this study, the 'before' and 'after' the intervention, or the first and the second year of the crop insurance, were compared. As there is no baseline survey the interviews use clients' recall, as they were asked to recall their score on selected variables before the project and their status now, or concerning the present and the past season. Key variables are agricultural inputs and output variables and the resulting productivity and income of the farmers.

The household survey included a combination of both structured and open questions. The household survey included client outcome data, performance, income, asset changes as well as non-financial outcomes, and assessed customer satisfaction and value by using agricultural insurance products. Part of the questionnaire is based on the PACE client satisfaction and value assessment (ILO, 2012), which helps to get an impression of behavioural changes and indications of impact, customer satisfaction and reasons for purchasing this product. Questions about the perceived value for money for crop insurance were also asked to identify factors that drive the up-take of the product.

The agricultural insurance sector is nascent in Tanzania: no agri-insurance products at all were reported in the microinsurance landscape in Africa in 2015.¹ However, with strong life, credit life and health, Tanzania sees the largest proportion of its gross written premium coming from micro insurance with 6.4% in the region. This gives the country a promising potential. In 2013 the supervisor for the insurance sector (Tanzania Insurance Regulatory Authority) issued a microinsurance regulation to boost the sector. The results still have to be seen and ACRE is clearly a first mover in this market with some competition out of Kenya with PULA (develops insurance products and distributes them to farmers). As in many Sub-Saharan countries the regulator faces resource constraints that translate in time consuming license processes. Recent market intelligence also revealed that the insurance industry is in the process of setting up an agriculture pool that would allow a central underwriting and spreading of risk. The main shortage clearly remains know-how and the ability to develop scalable products that will be sustainable when subsidies dry out. In the meantime, the regulator is looking to public-private partnerships on the grounds that premium cannot otherwise be affordable. In this context WII provides an innovative approach using satellites and mobile telephones to reduce transaction costs, however the mass distribution challenge has not yet been fully solved.

Land owned by the farmers

In 1999 Tanzania passed a series of land laws and regulations that granted customary rights of occupancy equal status to other property rights, or de facto ownership. In a number of cases farmers had bought or leased additional land. In the second year the average of these farmers would increase to 6.03 acre. There are around 30 landowners owning more than 10 acres. 45 farmers have leased land, of which 28 do not own land and 17 add leased land to the land they own.

The farmers interviewed owned at the average 4.98 acres during the first year and 5.22 acres during the second year. In a number of cases farmers had bought or leased additional land. 28 farmers had no land during the first year (but leased) and the other farmers would then have 5.79 acres at the average. In the second year 27 had no land. The average land, correcting for those not owning land, was 6.03 acre. 45 farmers have leased land, of which 28 do not own land themselves and 17 added leased land to the land they own. In the first year the average size of leased land (for 41 farmers) was 6.78 acres and in the second year (for 46 farmers) 10.39 acres. A remarkable increase in number of farmers leasing and in the amount of land leased.

The conclusion is that the farms are relatively small, but land is available. Only some farmers went into hybrid seeds in a big way and they often suffered in the second year because of less rain. In many locations there is also a need for additional water supply.

Most farmers are not just maize farmers but engaged in a number of activities, ranging from growing other cash crops (cotton or groundnuts), to keeping animals (cows, pigs or chicken), or running a business. On average the 200 farmers interviewed were involved in 2.8 different agricultural activities. The focus in the interviews was on maize, but diversification is also a strategy to mitigate risks related to agriculture. If maize is not doing well, or prices are very

low, the other agricultural activities help the farmers to survive and feed their family. When maize is doing well, like in the first year of reference, people can earn a lot of money allowing them 'to prepare for the next season' (buying the necessary inputs), to pay school fees and to build a house or part of it.

Most farmers have other agricultural activities than growing maize (89%), such as growing a cash crop (cotton or groundnuts), or growing vegetables, keeping cows, pigs or chicken. 107 out of 200 farmers declared such a source of income and provided the figures. At the average they earn as much from these secondary activities as from growing maize. Another 29 declared another activity, but could not give an estimate of the net returns per month of for example a shop or a local beer brewery. However, this secondary income may help their family to survive a bad harvest. Irrigation infrastructure is limited in Tanzania and in many locations there is a need for additional water supply. The presence of irrigation infrastructure is very limited. 177 farmers depend completely on the rain. The others can take water from a river or lake, but usually depend on a furrow or bring the water in buckets. 140 farmers claim there is often not enough rain. Water supply is about three quarters of what they need for their maize.

Who is the average farmer? In our sample he may be a she (40% of the 200 farmers interviewed were women), having an average age of 47.6 years and a family of in total 6.6 people. 13 farmers have not been at school, while 84% went to primary school and another 18 had secondary education, while two had been to university. 18 (9%) farmers had no mobile phone at all, or it was stolen, it had broken down or no credit. 163 (82%) had a simple mobile phone, while the remaining farmers had smart phones (7%), even with internet (another 3%, or 10% in total). They often used several providers and the farmers in Iringa, who we asked whether they used the phone for payments, almost always answered yes.

Most farmers hire a group of workers to prepare the land, or for sowing, weeding or harvesting. At the average they employ 3.2 men and 1.9 women, paying about 3000 TSh. per day. Poor farmers depend on their family labour, on 'ujama' (traditional solidarity groups) or new groups set up for example by 1AF. These groups help each other without payment. The main cost of input is the hybrid seed in the case of SeedCo (11,000 TSh. for an acre) or in the other modalities the farmers pay for the package of fertilizer, hybrid seeds, technical advice and an insurance. The 1AF charges 235,000 (100 Euros) for a package for 1 acre in the form of a loan to be repaid in a period of ten months. The turnover of the farmers in year one was five times zero because these farmers did not grow maize in that year. In 9 cases we could not get an answer. The remaining 186 had an average turnover of 1,060,000 TSh. The turnover of farming in the second year was only two times zero because these farmers claimed not to have harvested any maize because of the drought. In one case we could not get an answer, while the remaining 197 had an average turnover of 1,079,000 TSh., which is slightly more than in the first year, despite the poor weather conditions and the lower average price paid in the second year.

28 farmers (14%) do not declare that they own a house in the first year. The prices of houses range from a few hundred thousand to 15 million TSh. The average value for those 172 farmers owning a house is 1,455,556 TSh. Similarly we calculated the average value of motorbikes and/or bicycles, the education expenditures, the health expenditures and the value of other assets in the first and the second year. In the second year only 17 farmers do not declare that they own a house and for one farmer we do not have the answer. We came across examples where a good harvest in the first or the second year helped to build a house. The prices of the houses in the second year range from a few hundred thousand shillings to 40 million TSh. However, the average value for those owning a house is now 1,721,579 TSh. or substantially higher.

We see a net increase in the value of the assets between 2015/16 and 2016/17. For those owning houses the value increases at the average 266,013 TSh. It should be noted that the

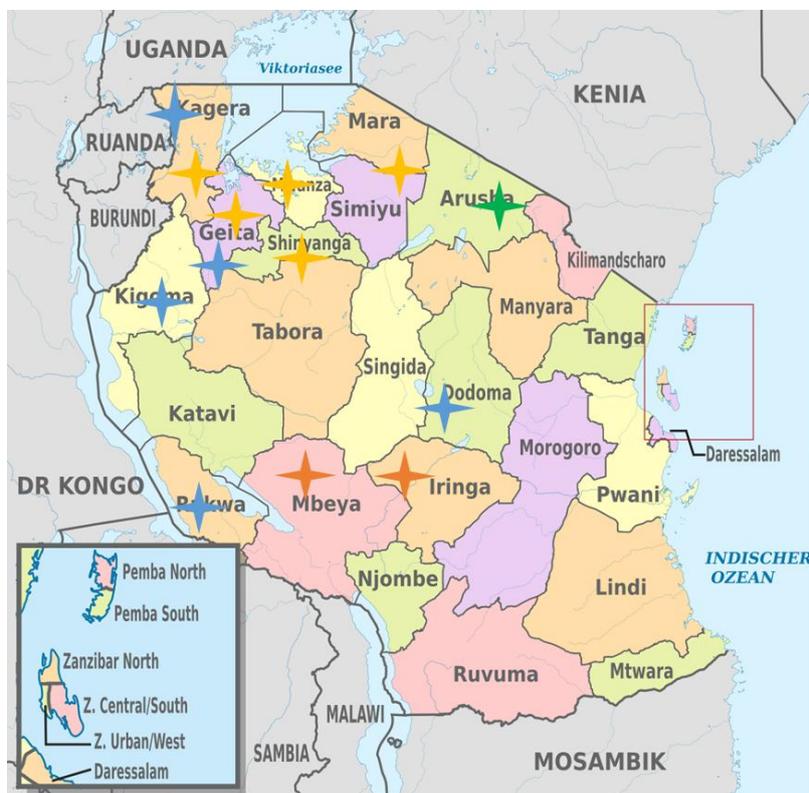
order of priority after a good harvest seems to be 1. improve the house, 2. more money for education and health expenditures and 3. investments in agriculture. Also 97 farmers own bikes or motorbikes (valuing 243.443 TSh. in year 1) and 103 in year two (valuing 275,786 TSh.), showing an increase in the number of farmers having these assets and their average wealth of 32,343 TSh. 110 farmers declared no expenditure for education in 2015/16 and 2016/17, but the other 90 farmers have spent on average 132,186 TSh. in the first year and 149,411 TSh. in the second year, showing again an increase of 17,225 TSh.

The picture for expenditures on health is slightly different. 156 farmers do not declare these expenditures, but the other 44 spend on average 65,714 TSh. in year one and 39 farmers 62,150 TSh in the second year. However, it would be difficult to prove that fewer people spending money on health care and the lower average expenditures are due to the introduction of insurances. The picture for 'other assets' is again quite similar to that of most categories of assets. 71 farmers have other assets and at the average in year 1, worth 647,521 TSh. and in year 2 valuing 804,950 TSh., a substantial increase of 156,970 TSh.

To conclude we find for each category of assets an improvement in average spending, while inflation was limited in 2017. Also the number of farmers mentioning these assets increased between year one and year two. The exception is the average expenditure on health care, which declined somewhat, just like the number of farmers mentioning health care expenditures for the last year. However, it would be difficult to prove that this is due to the project.

Differences between the three insurance modalities

The analysis of interviews reveals large differences between the three modalities used to obtain a crop insurance (table 1).



Map 1: Geographical location of clients per region

In the Mwanza region the 21 days germination insurance is provided by SeedCo through a card in the bag of hybrid seed, which the farmer buys. However, it requires farmers to register using their mobile phone. The replanting guarantee scheme (RPG) only covers germination failure during 21 days from the date of planting. The cover is paid by the seed company. When the sowing time approaches, he or she buys seeds at a certain seed distribution point. The bag of maize seed contains a card that gives access to insurance, provided the farmer registers with a USSD code with his/her mobile phone. If the registration takes place, the seed company pays a premium to the insurer and informs the farmer whether the germination is affected by a lack of rain during the first 21 days and hence she or he can come to the distributor of the hybrid seed to get new seed for free.

For other regions there is either a direct intervention by AT acting for AA with the insurance company UAP in the Arusha region, or an NGO (1AF) as intermediary in the Iringa region. The number of clients is now over 24,000 farmers in Iringa and more than 10,000 farmers in Arusha (status: 2018, correspondence with AA, 13-2-2018). In the first case the cover is the top up cover, or Full Season Weather Index Insurance Cover, where a farmer can top up the premium when the 21 day cover paid up by the insurance company is finished. The top up WII covers a farmer from vegetative/flowering stage to pre-harvesting stage.

All three modalities are weather index based insurances, meaning the insurance pays out if the rainfall is less (measured by satellite images) than an agreed threshold in a given period. The system can be flexibly adapted and extended via direct insurance with payment of a premium by the farmer. Alternatively a local NGO can arrange a type of group insurance, possibly linked to credit facilities. The core problem remains that the farmer does not always understand that he or she is insured, what is insured and when and under which conditions how much compensation is paid. In addition farmers do not always understand the concept of insurance i.e. risks are spread so that sufficient premium payments allow the insurance company to reimburse farmers in case of droughts.

Table 1 Differences between the three modalities in the three regions studied

	1AF in Iringa region	Mviwata in Arusha	SeedCo in Mwanza
Household size (number of persons)	5.3	11.0	6.3
Own land used (acres)	2.54	6.46	8.87
Inputs used year 2** (TZS)	376,870	179,850	337,940
Maize produced (kg)	2023	2996	2183
Average yields* (kg/acre)	1592	873	492
Farmers interviewed (number of persons)	108	39	53
% of women interviewed	55%	10%	32%
Average insurance pay-out (TZS)	20,000	32,000	n/a

* Assuming 50% of the land is used for maize. ** Mainly seeds and fertilizers.

The results show that farmers in the Arusha and Mwanza region have more land, bigger families and lower average yields than farmers in the Iringa region. In the Mwanza region the farmers have comparatively the lowest production per acre. In the Arusha region farmers comparatively spend the lowest amount on inputs used. In contrast, farmers in the Iringa region spend more on inputs and, with the support received from 1AF, they comparatively get the highest average yields per acre while they cultivate less land than in other regions. The data show that the delivery of an all-inclusive package to farmers with regular interaction within an institutional support structure delivers the best result in terms of productivity, investment and satisfaction.

Many farmers do not invest and those who invest rarely do it in agriculture. In the first year three farmers invested in a deep well, nine in a pump, and three in a tractor, or using tractor services. Some were buying a plough (16, often oxen drawn ploughs), other equipment (6) or tools (32). Most of the investments went in buildings (31, in particular building, or improving their houses), or making 'other' investments (21, mainly buying cattle or chicken or spending money on education of their children or for health purposes). In the second year another three farmers invested in a deep well, six in a pump, and four in a tractor, or using tractor services. Agricultural related investments were again minimal: buying a plough (3), other equipment (4) or tools (23). Most investments went again into building (36, in particular houses) or others (33, buying cattle or chicken and family related expenses such as health and education of the children).

Insurance coverage: Awareness of insured amounts and payouts

To measure customer satisfaction, or the client value of the insurance product farmers were asked, among others, whether they are insured and for what purpose. Farmers could choose between alternatives, but none of them reported having a livestock insurance, or having insured his/her equipment. About seven farmers had a health insurance from another job.

Table 2 Type of insurance coverage

Category	Full maize insurance	Germination coverage	No insurance or not aware
Self-reported / correct number	140/108	25/53	7/0

140 farmers (instead of 108) think they have full maize insurance, versus 25 with a germination cover only. This figure should be at least 53, but not all farmers are aware of what SeedCo is offering exactly and some did not send back the card they found in the bag with hybrid seed, because of ignorance.

The analysis of the client satisfaction reveals what farmers know about the organisation involved in providing crop insurance in the rural areas and which organizations are implementing the program now. The 1AF is known by the largest number of farmers, also because half of the survey concerned farmers in the Iringa region where the 1AF is the dominant party. Secondly, Acre Africa is known by a large number of farmers, just like Mwiwata, because they provided the financial education training with support of SCBF in the different regions. The implementation is done by field staff and trainers. Most farmers know the field staff, local leaders and trainers. They are mentioned to implement the project.

25 farmers were not insured in the first year or not aware of it (4 farmers) and 25 farmers did not want insurance in the second year. Not only farmers were not aware that they were insured, most farmers also do not know what the insurance cover entails. The non-insured farmers in the second year had either given up on the program, were never interested, or not able to register for different reasons. We suspect some may want to leave because they had problems repaying the loan taken in the first year. 1AF deemphasizes the insurance part of the package they provide, fearing regulatory issues with the government. The Government of Tanzania (GOT) has created a supervisor for the insurance sector and companies need a license and there may be fees and taxes to be paid. Farmers have insured between one and five acres. The average in the first year was 1.71 acres and in the second year 2.66 acres. This increase proves that farmers see a benefit in receiving hybrid seeds and being insured.

Most farmers interviewed do not know how much they pay for the insurance and this does not seem to be explained to them. The 45 farmers that gave an answer to this question estimated they paid about 29,555 TZS (or some 15 dollar) out of the 100 dollar loan package (in case of 1 acre), which is three times higher than in reality.

Table 3 Insurance coverage by year

Variable	First year	Second year
Number of farmers insured in the sample (not necessarily the same 175)	175	175
Area insured	Average of 1.71 acres	Average of 2.66 acres

With regards to the reasons of taking an insurance:

- 1AF offered it as part of the loan (17 farmers),
- SeedCo offered the card in the bag to us (5 farmers)
- These organizations (1AF and AT) provided training and we wanted to enjoy the benefits, to get support in farming (8 farmers)
- Farmers were very positive about the funeral insurance (13 farmers)
- Farmers emphasized it is positive because the inputs provided lead to higher yields (12 farmers)

The insurance covers risks, like droughts and climate change (42 farmers). Only 11 farmers received a pay-out of the insurance in the first year, ranging from 10,000 to 44,000 TZS, another four said they had received a payment but did not remember the amount.ⁱⁱ The average amount received is around 18,000 TZS. 158 farmers with insurance did not report getting a payment.

In 2016/17 59 farmers received a payment, another three reported a payment but did not recall the amount. The amounts ranged from 1,000 to 150,000 TZS.ⁱⁱⁱ The average amount they received (excluding the three outliers) is around 27,643 TZS which is 1.5 the average pay-out the year before and aligns with the farmers' complaints that 2016/17 was a bad year in terms of rain. 116 farmers with insurance did not get a payment in the second year. Some of the farmers complained about this. They ask for broadening of the coverage, more training, making the insurance more transparent and an increase of the pay-outs.

Table 4 Insurance Pay-outs

Variable	First year	Second year	Increase relative to first year
Number of farmers with pay-outs	16	59	+43
Amount of pay-outs (TZS)	18,000	27,643	+9,643

Customer satisfaction

The farmers were generally positive about the insurance, since the insurance offers a feeling of security and the intermediary organizations such as 1AF, Mviwata, or AA-UAP reduce the pending liability in case of a drought. Farmers also noted that 'We get some money for investments' (9) or we are 'now producing more food' (12) or 'yields were higher (37 farmers)'. However, some farmers were critical because no payments were made, although they had losses in the second year.

Overall farmers are positive in their appreciation of the insurance but are also aware about some of the limitations of the insurance system. With regards to possible product improvements, farmers said:

Farmers said 'we want higher payouts' (18 farmers), or 'we need more information, training and education' (28 farmers). Special concerns expressed included that 1AF leaders should

visit individual farmers to figure out the actual payout, that the assistance should come in time, or that the cost of fertilizer and seeds must be checked to enable farmers to afford these products (9 farmers). Get us pesticides (and insecticides) and enlarge the insurance cover to also include caterpillars (20 farmers). Help us to find markets, improve the market price and open the borders (17 farmers). They want more transparency concerning the weather related data and state the need for loans, or access to credit (21 farmers). It can be concluded that the farmers are clear in their appreciation of the insurance, but also know the limitations of the insurance system and they express their needs and critique very clearly.

The importance of land for the success of maize crop insurance in Tanzania

Crop insurance is an innovation, helping small maize farmers in Tanzania to make a step towards a green revolution, another innovation in Africa. Not only additional agricultural services were provided through this programme, also existing technological options were used to reach as many farmers as possible at minimum cost.

Evaluation according to DAC criteria

The main objectives of the SCBF funded projects were to provide financial education and scale up crop insurance for maize farmers. The project has been implemented by ACRE Africa and the number of farmers trained and ending up with insurance is over 24,000 in Iringa and more than 10,000 in Arusha. This means the original objective of reaching at least 15,000 farmers has been achieved. Smallholder farmers have been educated about modern agriculture and insurance products available to them. However, based on the survey farmers do not fully understand the insurance, know the premium they pay, or the risks covered by the insurance and ask for more education.

The projects contributed to the training of thousands of farmers in the Arusha, Iringa and Mwanza regions, combined with the upscaling of crop insurance. Without SCBF maize weather insurance would have taken more time to reach these farmers, although crop insurance has been introduced on a limited scale (and not WII) for other cash crops. In collaboration with AT it is currently also introduced as part of a contract farming arrangement where the contracting party provides a package of inputs, including insurance (GAFCO). This may be considered a spinoff of the project. SCBF has been a catalyst in this process.

Effectiveness and efficiency of the intervention

The collaboration with AIRTEL did not work out as envisaged as the firm went through a reorganization and did not have coverage in all the relevant regions. Only SeedCo's replanting guarantee mainly works through mobile phone, although farmers are not paid through topping up credit on their phones.

The real challenge seems to be rolling out the intervention on a larger scale. 1AF has achieved the best results so far. SeedCo could potentially reach a larger number of farmers because of their model and could do that even faster with their germination cover. However, this does not seem to be a priority for the company (e.g. staff in the field does not know about the insurance and reported not to provide the cards anymore once a regional market is conquered).

Management and staff of AA, AT and 1AF were all satisfied with the support of SCBF, which allowed them to roll out a support package (1AF and AT in the direct mode). 1AF has been using another insurance company in 2018, which shows that market competition is working. For SeedCo the collaboration with other stakeholders is less important because they consider the insurance more a marketing tool and do not provide advice, supplementary inputs or broader coverage.

The question whether the objectives have been achieved in an economically efficient way is hard to answer, but given the limited amounts involved SCBF certainly had impact. With regards to the technical assistance provided, it is difficult to find back the traces of the original support given at the village level. On the ground three different modalities have developed, one more successful than the others. In efficiency terms continuing to support 1AF seems probably the most cost-effective model.

The impact of the intervention

Does the intervention address key clients' need, and does it contribute to reaching development objectives? The impact of the introduced crop insurance is analyzed by looking at a number of variables, such as household's income, assets and agricultural productivity in the first and in the second year, as shown in the table below. In addition, a number of non-financial assets has been quantified, such as houses built or improved, purchase of means of transportation, expenditures on education, expenditures on health and other assets.

28 farmers (14%) do not declare that they own a house in the first year. The prices of houses range from a few hundred thousand to 15 million TSh. The average value for those 172 farmers owning a house is 1,455,556 TSh. Similarly we calculated the average value of motorbikes and/or bicycles, the education expenditures, the health expenditures and the value of other assets in the first and the second year. In the second year only 17 farmers do not declare that they own a house and for one farmer we do not have the answer. We came across examples where a good harvest in the first or the second year helped to build a house. The prices of the houses in the second year range from a few hundred thousand shillings to 40 million TSh. However, the average value for those owning a house is now 1,721,579 TSh. or substantially higher. Similarly we calculated the average expenditures for motorbikes and/or bicycles, the education expenditures, the health expenditures, and the value of other assets.

We see a net increase in the value of the assets between 2015/16 and 2016/17. For those owning houses the value increases at the average 266,013 TSh. It should be noted that the order of priority after a good harvest seems to be 1. improve the house, 2. more money for education and health expenditures and 3. investments in agriculture. Also 97 farmers own bikes or motorbikes (valuing 243,443 TSh. in year 1) and 103 in year two (valuing 275,786 TSh.), showing an increase in the number of farmers having these assets and their average wealth of 32,343 TSh. 110 farmers declared no expenditure for education in 2015/16 and 2016/17, but the other 90 farmers have spent on average 132,186 TSh. in the first year and 149,411 TSh. in the second year, showing again an increase of 17,225 TSh.

The picture for expenditures on health is slightly different. 156 farmers do not declare these expenditures, but the other 44 spend on average 65,714 TSh. in year one and 39 farmers 62,150 TSh in the second year. However, it would be difficult to prove that fewer people spending money on health care and the lower average expenditures are due to the introduction of insurances. The picture for 'other assets' is again quite similar to that of most categories of assets. 71 farmers have other assets and at the average in year 1, worth 647,521 TSh. and in year 2 valuing 804,950 TSh., a substantial increase of 156,970 TSh.

To conclude we find for each category of assets an improvement in average spending, while inflation was limited in 2017. Also the number of farmers mentioning these assets increased between year one and year two. The exception is the average expenditure on health care, which declined somewhat, just like the number of farmers mentioning health care expenditures for the last year. However, it would be difficult to prove that this is due to the project.

Table 5 Impact measured by the difference between variables in year 1 and 2

Variable/average	First year	Second year	Increase in 2 years
Land used (in acres)	4.98	5.22	+0.24
Inputs (TZS)	283,825	327,450	+43,625
Weekly consumption (TZS)	20,911	23,576	+2,665
Monthly farm income (TZS)	77,665	92,161	+14,496
Production maize (Kg)	1922.76	2252.9	+330.14
Productivity* (Kg/Acre)	772.2	863.2	+91.0
Production turnover (TZS)	1,060,000	1,079,000	+19,000
Investments outside agriculture (nr of farmers)	52 out of 121 farmers	69 of 113 farmers	a small increase in number of farmers investing outside agr
Value house (TZS)	1,455,556 (sample: 172 farmers)	1,721,579 (sample: 182 farmers)	+266,013
Value motorbike or bicycle (TZS)	243,443 (sample: 97 farmers)	275,786 (sample: 103 farmers)	+32,343
Education expenditures (TZS)	132,186 (sample: 90 farmers)	149,411 (sample: 90 farmers)	+17,225
Health expenditures (TZS)	65,714 (sample: 44 farmers)	62,150 (sample: 39 farmers)	-3,564
Other assets (TZS)	647,521 (sample: 71 farmers)	804,980 (sample: 100 farmers)	+156,970

* Assuming 50% of the land is used for maize.

General conclusions

The main underlying problem in Tanzania is the lack of productivity of many farms. As such it is key to support the transition from traditional maize to hybrid seeds to modernize agriculture, increase rural incomes and food supply. Weather-index base crop insurance is a crucial piece to strengthen livelihoods of farmers but requires more support than financing local training activities and should be linked to agricultural finance. What is also needed next to hybrid seeds and insurance are basic inputs such as water (irrigation opportunities), improved land management, knowledge of and access to modern agricultural techniques.

Overall, the program has shown a net increase in most variables, including value of assets, weekly consumption, maize production and productivity, education expenditures between year one and two. These improvements can be partially attributed to the availability of hybrid seeds and crop insurance. However, an impact evaluation is usually made on the assumption of all things being equal, which is not the case here. Real problems for the farmers during the 2017/2018 season were caterpillars and the low market price (fluctuation from over 100,000 TZS in 2015/16 to as low as 30,000 TZS in 2016/17), among others due to the government closing the border for exports.

The modality used to provide crop insurances to the farmers is important and we have identified three different models: (i) the NGO model with 1AF, (ii) the private sector limited insurance cover with SeedCo and (iii) the efforts of AA/AT directly with UAP. The farmers interviewed appreciate very much the insurance and the consideration to their problems. Farmers have enjoyed the best practice training and the package of inputs under the direct and 1AF mode. The same farmers are also critical about the limited information and training provided, the lack of transparency concerning the system of satellite weather information and the calculation of the pay-outs amounts in case of drought, which they consider often as too small, compared to the damage incurred.

The **Once Acre Fund** approach is the most successful of the three, due to its large presence in the Iringa region, with a village coordinator in every major village. It benefits from their client orientation and long-term support in the form of a loan for a package made attractive by adding different insurances (crop, credit life and funeral). The lesson learned is that insurance is important, but most useful in combination with other inputs and technical advice.

SeedCo only provides germination cover and has not always explained the purpose of the card in the bags of hybrid seeds that they are marketing. While their approach has not been very effective it does have the advantage of rolling out the germination insurance more quickly (if done properly). They have discontinued the distribution of cards in certain regions and do not use it as a marketing tool in all regions. They consider it a marketing tool, which is no longer necessary in a region where sales are good. Farmers buying SeedCo's hybrid seeds were sometimes frustrated that they did not know that they were insured.

Acre Africa/Acre Tanzania providing the insurance directly together with UAP is the most recent modality and farmers complained quite often about the lack of information, transparency and training and very few farmers have received payouts. Payments were so low that it was perceived as just getting the premium back, although almost nobody knows the premium paid for the insurance.

Airtel developed the location based system, but played a very limited role in the second stage of the project, although the high penetration rate of mobile telephones suggests they could be involved more. Even in the SeedCo mode, where farmers confirm the insurance by phone and get a notification about the pay-out by phone, they have to go to the trader to get new hybrid seeds if the seeds fail to germinate during the first 21 days.

We conclude that the distribution model and the intermediary used to introduce the insurance is crucial. The delivery of an all-inclusive package to farmers with regular interaction within an institutional support structure delivers the best result in terms of productivity, investment and satisfaction.

The challenge remains how to come to scale and break-even. A positive policy environment is a pre-condition for this. However, the current agricultural insurance practice is not really mobile telephone based. Transaction costs may be lowered further if information about the insurance, the drought, the expected payouts and the actual payment could be provided through mobile telephones, given the high penetration rates of mobile phones in rural areas. In addition, there are a number of improvements in the product that are necessary, including more transparency, more training to the farmers, extending the cover (in particular covering the effects of pests), and higher pay-outs.

Conclusions

Most farmers do not know how much they pay for the insurance, but they are generally positive about it, since the insurance offers a feeling of security and the intermediary organizations reduce the loan in case of a crisis. However, some farmers were critical because no payments were made despite limited rains, or the pay-outs were too low. They want support to find better markets for their produce and more transparency concerning pay-outs.

The results of the survey are analyzed to better understand their problems and the effects of insurance. Positive effects were found comparing data for the first and the second year. The project is relevant and had impact. Overall, we see a net increase in most variables, including the value of the assets between 2015/16 and 2016/17, including value of house and motorbike or bicycle. Furthermore there is an increase in:

- Weekly consumption as well as monthly farm income;

- Maize production and productivity;
- Education expenditures and other assets.

Based on the interviews usually the order of priority after a good harvest seems to be 1. improve the house, 2. more money for education and health expenditures and 3. investments in agriculture.

Besides indicators of the impact, also the outreach, efficiency and effectiveness of the interventions are analyzed and positive evidence is found. The impact of the size of the land of the farmers was analyzed, showing that there is something like a land market in Tanzania and that the bigger farmers benefit relatively more of the opportunity to get inputs and insure themselves for crop failure.

Supporting the transition from using traditional to hybrid seeds is recommended to increase rural incomes and food supply and contribute to food security in the country. It is important to select the intermediary carefully and to consider crop insurance as part of support package which should also include fertilizers and additional inputs like pesticides and access to water. There is scope for making the innovation more frugal, by really using only mobile phones for registration and pay-outs, which was currently not always the case. There is demand for this service from other regions, for other crops and risks (like caterpillars). More information and training should be provided to farmers and the insurance needs to be made more transparent. Complaints of farmers should be taken seriously.

It is recommended to modernize agriculture, to increase rural incomes and food supply. Land markets play an increasing important role and their functioning should be facilitated. For providing crop insurance it is important to select the intermediary carefully and to consider crop insurance as part of support package which should also include fertilizers and additional inputs like pesticides and access to water. There is also unsatisfied demand for insurance to be covered: from other regions, for other crops, for more land and for additional risks (like the damage due to caterpillars). More information and training should be provided to farmers and the insurance process needs to be made more transparent. The complaints of farmers should be taken seriously. SCBF should consider consultations with the government, to ensure support for crop insurances and facilitate the various steps to increase productivity of farmers, of which providing insurance is an important part. The challenge is to come to scale and break-even with this private sector initiative, which has helped farmers to run risks and become more entrepreneurial, buying or leasing additional land to increase their income.

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Notes

ⁱ The Landscape of Micro insurance in Africa 2015, The World Map of Microinsurance, Micro Insurance Center.

ⁱⁱ One farmer reported a payment of TSh 235,000, which represents exactly the full loan amount and was therefore not considered.

ⁱⁱⁱ Likewise a few farmers reported payments equals to the full loan for 1.5, 2 or 4 acres, and those numbers were not considered.

^{iv} The Economist, 20-1-2018: 39.