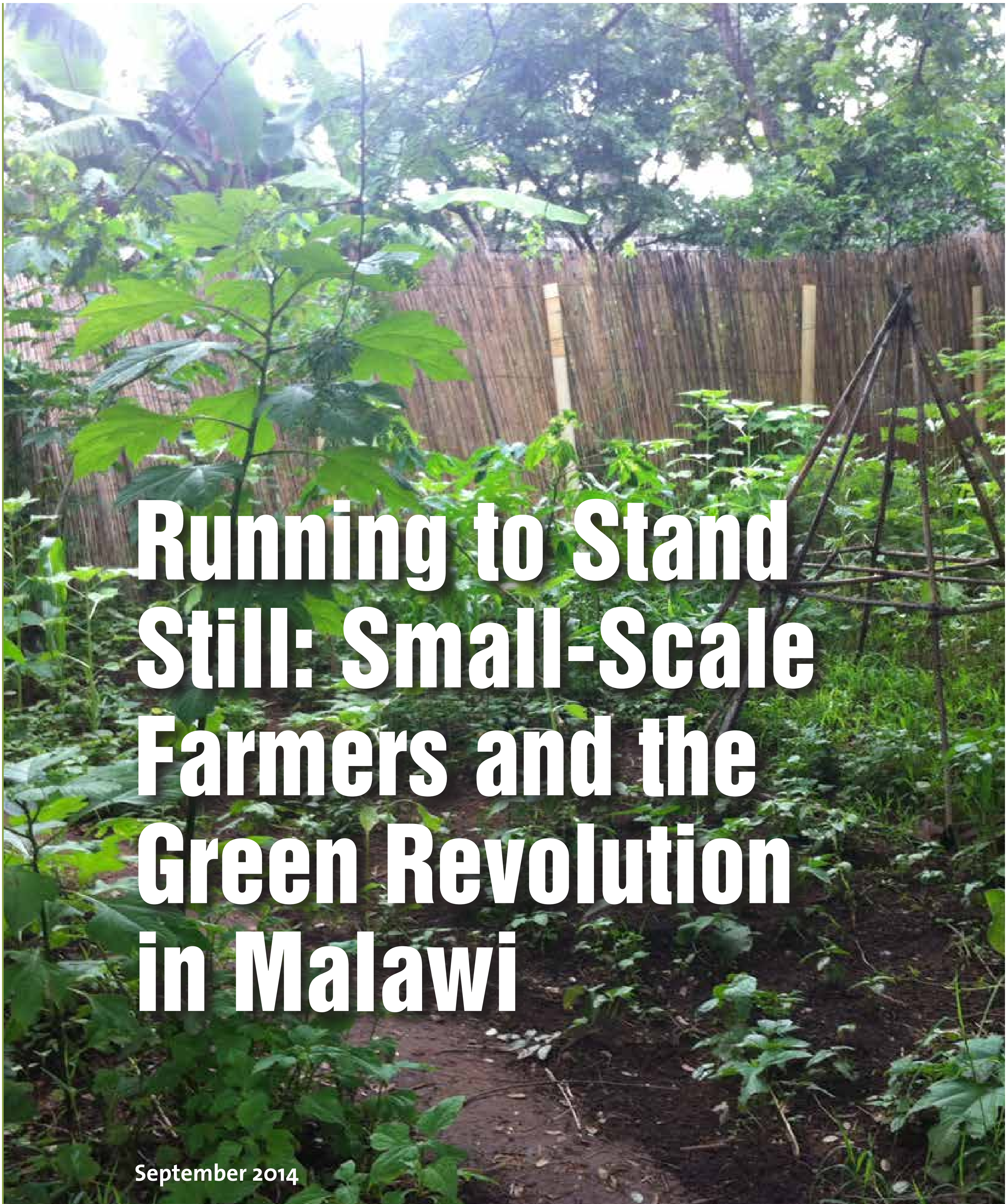

Running to Stand Still: Small-Scale Farmers and the Green Revolution in Malawi

September 2014

african centre for biosafety
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Contents

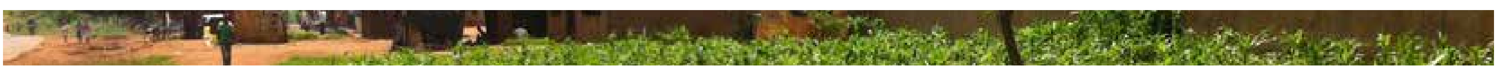
The African Centre for Biosafety (ACB) is a non-profit organisation, based in Johannesburg, South Africa. It was established to protect Africa's biodiversity, traditional knowledge, food production systems, culture and diversity, from the threats posed by genetic engineering in food and agriculture. It, has in addition to its work in the field of genetic engineering, also opposed biopiracy, agrofuels and the Green Revolution push in Africa, as it strongly supports social justice, equity and ecological sustainability.

The ACB has a respected record of evidence-based work and can play a vital role in the agro-ecological movement by striving towards seed sovereignty, built upon the values of equal access to and use of resources.

www.acbio.org.za
PO Box 29170, Melville 2109 South Africa
Tel: +27 (0)11 486 1156

Design and layout: Adam Rumball, Sharkbouys Designs, Johannesburg

Cover image: Stephen Greenberg



Acknowledgements

Research team:
Alinafe Banda (Kusamala)
Molly Cheatum (Kusamala)
Kondwani Chikadza (University of Malawi)
Ken Chilungulo (NASFAM)
Dr Blessings Chinsinga (University of Malawi)
Dr Stephen Greenberg (ACB)
Gareth Jones (ACB)
Frazer Mataya (NASFAM)

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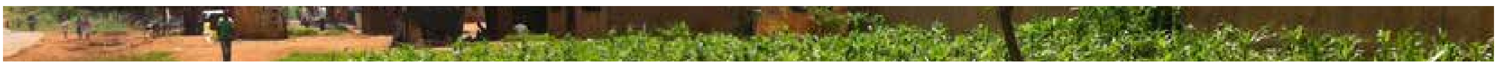
Acronyms

ACB	African Centre for Biosafety
ACE	Agricultural Commodities Exchange
ADMARC	Agricultural Development and Marketing Corporation
ADP	Agro-dealer Development Programme (AGRA)
AFSA	Alliance for Food Sovereignty in Africa
AGRA	Alliance for a Green Revolution in Africa
ANOVA	Analysis of variance
ASSMAG	Association of Smallholder Seed Multiplication Action Groups
AU	African Union
Ca	Calcium
CA	Conservation Agriculture
CAADP	Comprehensive African Agricultural Development Programme
CAN	Calcium ammonium nitrate
CEC	Cation exchange capacity
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CISANET	Civil Society Agriculture Network
CNFA	A non-profit international development organisation based in Washington DC
CO^2	Carbon dioxide
CSO	Civil Society Organisation
DARS	Department of Agricultural Research Services
DUS	Distinct, uniform and stable
EACI	Education for African Crop Improvement
ETG	Export Trading Group
FAO	United Nations Food and Agriculture Organisation
FGD	Focus group discussion
FIAAC	Fund for the Improvement and Adoption of African Crops (AGRA)
FISP	Farm Input Subsidy Programme
FO	Farmer Organisation
FOSCA	Farmer Organisation Support Centre in Africa
FSO	Farmer Support Organisation
FtF	Feed the Future (US government)
GDP	Gross Domestic Product
GM	Genetically Modified
GR	Green Revolution
H^+	Hydrogen ions
ICRAF	World Agroforestry Centre
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IITA	International Institute for Tropical Agriculture
IMF	International Monetary Fund
ISFM	Integrated Soil Fertility Management
ISSD	Integrated Seed Sector Development
K	Potassium



LRC	Land Resources Centre
MARDEF	Malawi Revolving Development Fund
MASP	Malawi Agro-dealer Strengthening Programme
Mg	Magnesium
MK	Malawian Kwacha
MNCs	Multinational Corporations
MoAFS	Ministry of Agriculture and Food Security
MSHC	Malawi Soil Health Consortium
N	Nitrogen
NAFSN	New Alliance for Food Security and Nutrition (G8)
NASFAM	National Smallholder Farmers' Association of Malawi
NEPAD	New Economic Partnership for Africa's Development
NGO	Non-governmental Organisation
NPK	Nitrogen, phosphorous, potassium
OAU	Organisation for African Unity
OPV	Open-pollinated Variety
P	Phosphorus
PASS	Programme for Africa's Seed Systems (AGRA)
PPP	Public-private Partnership
R&D	Research and Development
Rumark	Rural Market Development Trust
S	Sulphur
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SDC	Swiss Development Cooperation
SEPA	Seed Production for Africa (AGRA)
SFFRFM	Smallholder Farmer Fertiliser Revolving Fund of Malawi
SHP	Soil Health Programme (AGRA)
SPSS	Statistical Package for Social Sciences
SSTP	Scaling Seeds and Technologies Partnership
STAM	Seed Trade Association of Malawi
TIP	Targeted Input Programme
UPOV	Union for the Protection of New Varieties of Plants
VDC	Village Development Committee
WEF	World Economic Forum

EXECUTIVE SUMMARY

Introduction, context and methodology

Malawi has been hailed as a Green Revolution success story. But a closer look reveals farmers trapped in a cycle of debt and dependency on costly external inputs, and an eroding natural resource base. Small-scale farmers are using shockingly high levels of synthetic fertiliser at great financial cost to themselves and the government, with the additional consequence of rising soil infertility. Encouraged by government subsidies and the promise of massive yield increases farmers are increasingly adopting hybrid maize seed. However, adoption of these hybrid seeds comes at the cost of abandoning the diversity and resilience of local varieties and the ever-escalating requirement for synthetic fertiliser applications. Given structurally low product prices, the slight yield increases being realised by farmers seldom justify the added financial and ecological expense of the inputs. Indeed, findings show net transfers away from farming households to agribusinesses through the adoption of Green Revolution (GR) technologies. This report highlights the plight of small-scale farmers at the receiving end of the Green Revolution push in Malawi.

In early 2014 the African Centre for Biosafety (ACB) launched a multi-year research programme in southern and east Africa to investigate seed and soil fertility practices and the challenges facing small-scale farmers in the region. Malawi was the first country to be studied, and ACB worked with the National Smallholder Farmers' Association of Malawi (NASFAM), the Kusamala Institute of Agriculture and Ecology and Dr Blessings Chinsinga at the University of Malawi to conduct the research, and with Chitedze Research Station for the soil testing. The research programme has two broad aims: to contribute to the establishment of a regional research network on seed and soil fertility issues, and to offer an evidence-based critique of the GR agenda. The second aim includes a particular focus on the activities of the Alliance for a Green Revolution in Africa (AGRA), an institution that plays a critical coordinating role in expanding the GR on the African continent.

AGRA's work in the GR push is wide-ranging and includes support to public and private plant breeders, soil scientists, private input suppliers, agricultural credit extension and policy and advocacy. In Malawi, AGRA's largest investment to date has been the Malawi Agro-dealer Support Programme (MASP), run by US-based CNFA (a non-profit international development organisation) until 2012. There were two AGRA-sponsored projects within the study sites, the CNFA-managed MASP, falling under AGRA's Programme for Africa's Seed Systems (PASS), and support to NASFAM for pigeon pea integration as part of the Soil Health Programme (SHP). The impact of these projects to date is diffuse in the study sites. These projects have had a relatively small impact on farmers within the study sites so far, but they are only building blocks in a wider GR thrust in which AGRA's influence has been significant. AGRA is the co-ordinator of the recently established Scaling Seeds and Technologies Partnership (SSTP) under the auspices of the G8's New Alliance for Food Security and Nutrition (NAFSN). At the time this research was being conducted no practical activities were yet taking place under this partnership. Follow-up research to be conducted by ACB in 2015 will include investigation of these AGRA interventions in more detail, together with country partners where possible.

The research methodology included a short survey with 90 farmers in two NASFAM sites in Kasungu (Chamama and Chipala) and one Kusamala site in Dowa (Nambuma). The survey covered demographics, land, production and yields, agricultural practices and soil fertility and seed access and practices. Stratification was based on gender, age and production practices. A cross-section of conventional agriculture, conservation agriculture (CA) and agro-ecological practices were identified as the basis for a comparison of impacts on household nutrition, production and soil fertility. Analysis of the comparative aspects is planned as a longitudinal study, with this first survey designed as a baseline study. In addition to the baseline survey, interviews and focus groups were conducted with participating farmers, and discussions were held with a range of relevant national and local informants. The initial results reveal high levels of

hybridisation of conventional, CA and agro-ecological practices; with farmers simultaneously using purchased certified and hybrid seed and synthetic fertiliser and applying farming methods such as leaving crop residues on the field, intercropping and recycling seed. The uptake of GR technologies is uneven and the reasons for this are not as simple as lack of knowledge or access. Farmers also make choices and hedge risk by employing a range of differentiated practices. What follows is a condensed summary of the main results of this research, together with conclusions and recommendations for policy development and further work. A full report will be made available shortly, following this summary.

Farmer perceptions of agricultural challenges

Farmers identified high fertiliser prices (99%), lack of markets (82%), change in rainfall patterns (81%), and high seed prices (77%) as the most serious challenges currently facing them. These priorities were consistently high across the three sites. High input prices are a key limiting factor in the adoption of GR technologies, while low output prices are the product of structural disadvantages and adverse incorporation of small-scale farmers into liberalised global commodity markets. No significant gender differentials were identified within most of the serious challenges identified. Weak institutional support, with particular emphasis on extension and research, was identified as an issue in focus groups.

Although there was general consensus that farming had become more challenging over the past five years, some farmers felt that progress was being achieved. Many of these farmers tended to be retired workers with generally higher levels of education. The research reveals some differentiation among farmers, a trend that is inevitably accelerated by the introduction of GR technologies.

Nutrition and food security

Participants were asked questions about dietary diversity and whether their households were able to eat foods they are used to, as

proxies for household food security. Dietary diversity is a measure of the variety of foods consumed in a recent period, with three or fewer foods indicating lack of diversity. Around 8% of respondent households had consumed three or fewer categories of food in the past three days. This figure would have been higher if measured over the previous 24 hours. More than 80% of households had consumed maize, green leafy vegetables, 'other' vegetables (including tomatoes, onions, okra and others) and legumes in the past three days. But fewer than 60% of households had consumed rice, wheat products, any kind of meat, potatoes, fruit or vegetables high in Vitamin A. Sixty-nine per cent of respondents indicated they sometimes, often or always could not eat foods they are used to, while only 15% were always able to eat foods they are used to.

Results showed some differentiation between study sites regarding income being enough to cover basic needs. The majority of respondents in Chipala (77%) indicated current income was often enough to cover basic needs. By contrast, in Nambuma (89%) and Chamama (82%), the majority of respondents indicated their income was rarely or never enough to cover basic needs. This was one of many results showing some differentiation between farmers in different sites.

An early indication of a problem in the food system is flagged when households confirm they are not able to eat foods they are used to and yet they are are selling food. Although a relatively small number, 50–60% of the

households that were often or always unable to eat the foods they wanted to also sold maize, beans and groundnuts.

Most food consumed in households in the past three days was produced either by the household itself or purchased, with very little food being sourced from trade or barter, or being received as a gift or shared. The major food types produced by the household were maize (87%), pumpkin/orange sweet potato (87%), legumes (83%), eggs (69%) and potatoes (59%). Foods that were predominantly purchased include oils and fats (100%), sugar (96%), dairy (96%), fish (90%), rice and wheat (81%) and 'other' vegetables (75%). More than half the respondents had consumed fruit, which was split between own production and purchase. Banana (23%), papaya (22%) and mango (20%) were the most common food trees grown by participating households.

In rural Malawi many families run out of food well before the next harvest, meaning they are forced to abandon their own gardens in search of cash or in-kind employment in order to access food. This trend was reflected in the survey, with 56% of households running out of food between the critical farming months of October and February. Only six households, all in Chipala, said they did not run out of food, another sign of differentiation.

Land access and cultivation

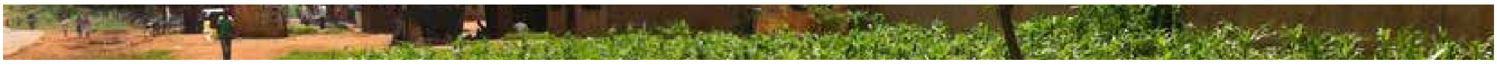
Although land was not a focus area of this research, land ownership and access is an essential variable in agricultural production. The survey included questions on the size of a respondent's land holdings, cultivated areas and the distances respondents had to travel to tend their fields.

The survey showed average land holdings of around 7 acres (2.8 ha[1]) per household with a variation of 4.5 acres in Nambuma, 6.4 acres in Chamama and 9.9 acres in Chipala; the last figure is skewed by one large land holding of 99 acres. Across all sites 57% of households reported they owned between 1 and 3ha, though in Nambuma almost three-quarters owned less than 2ha. This is another indicator of differentiation between the sites, with respondents in Nambuma tending to be less well-off and respondents in Chipala tending to be slightly better off.

Cultivated land includes own land, *dimba* land (*dimbo* land translates as wetland/s in Engish; this is land bordering a river where cultivation during the dry season depends on residual moisture), rented land and borrowed land. The portion of own land cultivated averaged around 70% of total land owned by households. Just under a third of households (30%) rented some land for cultivation, with the average size of rented land being 2.26 acres or just under 1 ha. Those who were cultivating *dimba* land reported land size of close to 1ha in all three sites. Of the three sites, Nambuma is more reliant on rentals and borrowing which signifies potential land demand (i.e. people needing more land than they own).

There are some significant relationships between the size of land holding and key challenges facing farming households. Changes in rainfall patterns and lack of markets are serious issues across all land ownership sizes. High seed prices are generally more of an issue with increasing farm size, from two-thirds in the landless category to 90% in the 3–4ha category and 82% in the >4ha category. Poor quality seed tends to be more of an issue

1. Accepting that one hectare is more or less 2.5 acres, based on a NASFAM survey



for smaller farmers, from one-fifth in the <1ha category to less than one-tenth in the >4ha category, but this is not an even trend. Generally seed quality is not a major issue.

The Malawi G8 Cooperation Framework commits the Malawian government to release 200,000 ha of land in both customary and leasehold areas for large-scale commercial agriculture by 2015. We must ask where this land will come from and who will be dispossessed as a result.

Production and yields

Not surprisingly, maize (hybrid and local, combined), groundnuts, tobacco and beans were the most widely produced crops in the three sites, followed by hybrid maize (as a distinct category from local maize) and soya. Hybrid maize yields were on average 519kg more than local maize yields. At the prevailing market price of MK60/kg (US$0.14[2]) this translates into a potential additional income of MK31,140/household (US$74.14). However, this does not justify the additional average input costs of MK5,798 (US$13.80) for hybrid maize seed plus MK81,296 (US$193.54) for NPK (three-component synthetic fertilisers) and urea which are used primarily on maize. When increased input costs are taken into account, farmers adopting GR technologies realise a potential income deficit of MK55,954 (US$133.22). Even if the synthetic fertiliser is also shared amongst other crops, overall production of these crops remains low and it is highly unlikely that farmers will realise a net profit by adopting these technologies. The short-term benefit of higher yields masks this net transfer from small-scale farming households to seed and fertiliser agribusinesses.

AGRA's seed work in Malawi emphasises maize, beans, soya, peas, groundnuts, cassava and sweet potato, so a mixture of commonly cultivated crops and less cultivated crops. There was some differentiation in the type of maize produced by area. In Nambuma a high percentage of respondents (80%) produced local maize, while in Chamama hybrid maize was predominant, at 90% of respondents.

Although other crops were not as widely produced there were a large number of smaller crops that generally are neglected by formal research and development (R&D) efforts because they are seen as non-commercial crops. Yet these crops play a critical role in ensuring local nutritional diversity. In a country where the majority of households are resource-poor farming households, these crops are extremely important.

Fifty-three per cent of the participating households planted on *dimba* land. Of these, 60% planted mustard, 48% planted pumpkin and 46% planted tomatoes. Fifty-one per cent of the participating households planted around their homesteads. A quarter of these planted papaya and a fifth planted pumpkin. There is a clear gender difference regarding the cultivation of *dimba* land—64% of women-headed households had not planted on *dimba* land in the past season, while 44% of male-headed households had not cultivated *dimba* land in the same period. This indicates lower land access for women.

On average, slightly less than 1.5 tons of maize was retained for home use. Because of greater yields, more hybrid maize on average was kept for home use (1,493kg) compared with local maize (1,173kg). Just over half the respondents retained more than 1 ton of hybrid maize, and just over a third of the producers retained more than 1 ton of local maize, for home use. The vast majority of producers of beans, groundnuts, pigeon pea, cow pea, soya and sweet potato kept less than 500kg of the product for home use.

The role of tobacco

Malawi is the world's most tobacco-reliant economy, with the crop accounting for over 60% of export earnings. Since the sector was liberalised in 1992, small-scale farmers have become the majority producers. NASFAM itself was established with funding from USAID in 1994 with a primary focus on integrating smallholders into commercial tobacco production. Kasungu and Dowa are both key tobacco producing areas in Malawi, with over

2. At a rate of US$1 = MK420, the prevailing rate at the time of the research.

Table A: Tobacco cost breakdown for one club, Chamama

	Total (48 bales) (US$)	**Per bale** (US$)	**Per bale** (MK)
a. Proceeds from sales	8,445	175.9	73,878
b. Charges at auction floor (selling concession, TCC cess and class, ARET, NASFAM levies)	359.2	7.5	3,150
c. Deductions (NASFAM transport, hessian, tax)	909.56	18.95	7,959
d. Loan repayment	6,042.65	125.89	52,873
e. Baling jack	102.86 (MK43,200)	2.14	900
f. Transport to action committee	114.29 (MK48,000)	2.38	1,000
g. Profit after deductions, loan repayment etc. (but excluding labour)	916.44	19.09	8,019
h. Average per farmer[3]	114.56 (MK48,115)	2.39	1,002
i. Farmers' share of total sale (g/a x100)	10.85%		

Source: focus group discussions and receipts
MK/US$ 420:1 exchange

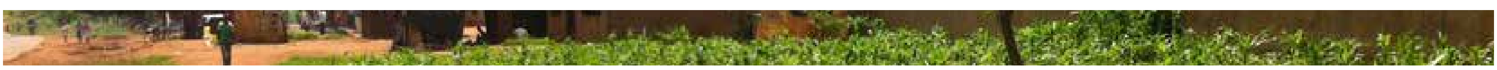
81% of participating farmers growing tobacco in the 2013/14 season. Table A shows the tobacco cost breakdown of a club in Chamama and indicates that the farmers' share of total value was less than 11% of dried leaf. In order to generate the MK48,115 (US$114.56) income from a season's labour, farmers bear input costs of MK181,480 (US$432.10). Although these costs are usually covered by tobacco companies through value chain financing on contract (credit to purchase inputs with deductions before payment), farmers bear the risk of production failure.

This case reveals a classic contract farming model, where farmers with no bargaining power take on loans to grow cash crops yet receive a small fraction of its final value. As the World Bank (2003:5) states, "farmers are carried away by the high gross return from tobacco instead of comparing the net returns". There are other negative impacts associated with tobacco cultivation. It is not a crop that can be kept back for consumption in times of acute hunger, nor is there any prospect of finding alternative buyers or value addition. Further, tobacco extracts large amounts of nutrients from the soil and requires the application of large quantities of pesticides. The value chain needs to be investigated further, together with farmers, to examine the real benefits for them, in the long run, of planting tobacco.

Seed access and practices

Seed is a key focus in the GR thrust. As outlined above, AGRA has a major focus on seed in Malawi and is involved in supporting R&D and the production and distribution of improved seed for all the major crops grown by survey respondents, aside from tobacco. Although germplasm in the public sphere—national agricultural research systems and the Consultative Group for International Agricultural Research (CGIAR) institutes—is the basis of much of this development, the long-term aim is to involve the private sector in production and distribution. The implications for farmer-managed seed systems and agro-biodiversity are downplayed, with farmer-

3. Total figures on the auction house receipt for the tobacco club of eight farmers in this case.



managed systems considered inferior to profit-generating private activity in seed production and distribution.

One of the objectives of the study was to investigate seed access, farmer-based seed practices, and the implications of these practices on agricultural productivity. Investigations found that certified or hybrid seed use was limited to maize (73% of respondents) and tobacco (42%). Through the FISP the government of Malawi plays a major role in creating a market for hybrid maize seed and, to a lesser extent, improved legumes, while the tobacco companies have their own closed value chains for improved tobacco seed. Despite this, respondents recycled even hybrid seed for various reasons, the most common of which were to ensure seed availability when the first rains arrive and the high prices of certified seed which limit access.

AGRA-supported seed development, production and distribution programmes cover a fairly wide range of crop types in Malawi, but farmers in the survey are still using non-certified seed. Almost half the respondents planted non-certified or local maize varieties, and the majority of farmers planted non-certified cow peas (87%, but on a low base), beans (75%) and soya (60%). Many farmers planted both hybrid and local/uncertified maize. The availability of certified seed may be an issue, but of more importance is the limited access to certified seed. This is due to high prices and various quality factors (including storage, processing, conversion rates of kernels to flour, taste, insect resistance both in the field and in storage, and drought tolerance). Respondents tended to reserve local maize for consumption, and sell a higher proportion of their hybrid maize. The availability of local and uncertified varieties offers farmers a range of options.

Seed recycling is a common practice, with 80% of local maize, 73% of cowpea, 64% of beans, 55% of groundnuts and 54% of soybean seeds being recycled. Hybrid maize is the only seed that was mostly purchased from seed dealers (59%). Bean seed was the next most purchased seed, but only 18% of respondents who used bean seed in the past season had purchased it. NASFAM and tobacco company loans are an important source of pigeon pea seed (60%) and tobacco seed (12%) respectively. NASFAM's introduction of pigeon pea was sponsored by AGRA. The programme has not had a major impact in the research sites to date, with small quantities of seed being distributed (less than 5kg per participating farming household) and limited returns for farmers. An aspect of planned follow-up research will investigate in more detail the functioning and impacts of NASFAM's pigeon pea programme, including the extent to which it has taken off in other areas of Malawi. Further investigation will also explore other improved and hybrid seed varieties sponsored by AGRA in Malawi.

The research did not uncover any systematic market in uncertified seed in the sites and confirmed that respondents tended to save seed primarily for their own use. There is no practical support from government for the saving or exchange of uncertified seed, while efforts by AGRA and government alike tend towards replacing uncertified seeds with certified varieties. This could bring improved germplasm into seed systems but may have negative impacts on seed diversity.
Survey responses indicated a bigger variation in the cost between certified and uncertified seed than in perceived quality. This poses a question about the value for money of GR technologies. The main seed costs incurred by respondents

were for hybrid maize and certified tobacco seed. However, these costs are relatively small when compared with the cost of fertiliser inputs (see below). A high percentage of respondents incurred no expense in procuring seed for local maize (85%), groundnuts (64%) and beans (59%), as well as pigeon peas (100%) and cow peas (78%). This emphasises that the practices of seed saving and exchange are very well established and vital in Malawi.

Seed quality was not a major issue for most crops. Local maize seed was assessed by respondents as being of lower quality than hybrid maize seed. The quality of their hybrid maize seed was assessed as good by 85% of the respondents, and the quality of local maize seed was assessed as good by 62% of users. While this signifies some quality issues for local or uncertified maize, farmers are not arguing to replace local seed with hybrid or certified seed. Given the high numbers of farmers still using this seed, we can deduce that it makes an important contribution to on-farm production systems. The quality of uncertified seeds were all assessed as good by the majority of a small sample of users—pigeon pea (100%), beans (81%), groundnuts (81%), cowpea (77%) and soya (72%). However, with open pollinated varieties (OPVs), even official advice is that seed can be recycled for three years before new seed should be purchased. So it is a question of how long the farmers have been recycling, and how recycling fits into the dissemination of improved OPVs. Efforts can be geared towards investigating the quality of local or uncertified seed, identifying the positive characteristics of local/uncertified seed and developing responses based on participatory methods with farmers to improve the seed.

Agricultural practices and soil fertility

A high proportion of respondents engaged in various types of agro-ecological practices, including those that fall within the definition of conservation agriculture (CA). In Malawi CA is defined as minimum soil disturbance, permanent ground cover and crop rotation or intercropping (including the use of legumes for nitrogen fixing). These practices can also be considered agro-ecological methods, although GR advocates, including AGRA, add to the definition the use of synthetic fertilisers, hybrid and certified seeds and herbicides. The research clearly shows a mix of practices encompassing both GR inputs and agro-ecological practices, although this is uneven across farming households.

More than 8 out of 10 households practised intercropping with hybrid maize/beans, and tobacco/pumpkin being the main two intercrops. Tobacco companies discourage the tobacco/pumpkin intercrop because the plants come from the same family and the intercrop increases the threat of diseases spreading. Overall nearly three-quarters (73%) of respondents practised at least two of the three CA base practices. Almost 9 out of 10 farming households applied some kind of organic content to the soil, in the form of crop residues, animal manure, compost or green manure. This indicates that agro-ecology is not something new that must be introduced but is part of existing practice. GR inputs rely on this fundamental practical base for their success. If GR inputs undermine this base over time, it could lead to the collapse of the agricultural system as a whole, including the GR. The existing base of practices offers a very strong foundation to adopt and advance agro-ecological methods, since these practices do not need to be introduced by external agents.

Given the combination of production practices it is not possible at this early stage to make any definitive comments on the relationship between the adoption of production practices and household food security. The research results are a baseline that can be measured and compared over time. Generally, the survey indicated a positive correlation between households practicing agro-ecological practices (defined for these purposes as the three CA base practices plus the addition of organic content to the soil) and household food security. However, many of these households also used various GR technologies. In any case, correlation does not imply causation and further work must be done to understand the relationship between the adoption of production practices and household nutrition. Synthetic fertilisers are widely and intensively used in the study sites and are procured from a variety of sources (Table B). Urea and NPK were the most widely used synthetic fertilisers, with 81% of respondent households using

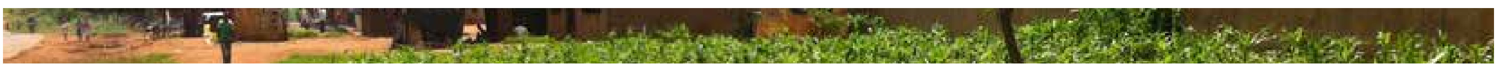


Table B: Mean amount of fertiliser applied, costs and sources in the past year

Type of fertiliser	Mean payment (MK) by respondents using fertiliser	Mean payment in US$	Mean kg applied by respondents using fertiliser	Major sources of fertiliser
Urea base	19,204.55	45.73	75	Agro-dealer (44%), FISP (37%), tobacco company (15%)
Urea top	27,544.52	65.58	**131.7**	
NPK base	**31,780.09**	75.67	**150.2**	Agro-dealer (44%), FISP (25%), tobacco company (16%)
NPK top	2,766.67	6.59	31.7	
CAN base	32,800.00	78.10	116.7	Agro-dealer (39%), tobacco company (31%), ADMARC (8%)
CAN top	**36,077.78**	85.90	154.8	
Super D/D compound	**65,516.67**	155.99	**230.6**	Agro-dealer (28%), tobacco company (50%), and farmer/villager (17%)
Total (synthetic)	215,726.28	513.63	**341.5**	
Animal manure	1,134.62	2.70	2,569.5	Own production (97%)
Green manure	777.78	1.85	1,456.4	Own production (100%)
How much on total fertiliser applications where breakdown between types in unknown	307,641.25	732.48		
Average expenditure on all fertiliser	95,415.70	227.18		

urea top dressing and 68% using NPK (mostly 23:21:0) basal. There was some unevenness in use across the sites—over 90% of respondents in Chamama used both NPK and urea while only 47% of respondents in Nambuma used NPK. The tobacco fertilisers, CAN and Super D or D compound, were used by one-fifth to a quarter of households. Mean application rates across all households that confirmed using any kind of synthetic fertiliser was an extremely high 341.5kg on cultivated land that, on average, was around 2ha (see above). Fertiliser use on different pieces of land was not fully investigated, but the research shows that synthetic fertiliser use is concentrated on maize and tobacco plots. This means synthetic fertiliser use is even more intensive than this measure, which divides fertiliser use by the entire land owned. The high cost of fertiliser was identified as a 'serious' problem by every respondent except one.

The average amount spent on fertilisers across all households was MK95,000 (US$226.19), more than the market value of 1.5 tons of maize at MK60/kg (US$210.00) in local markets. At

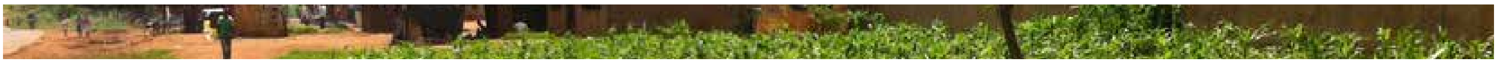
the same time, the combination of hybrid seed and synthetic fertiliser application increases yields by around 500kg, so this is a very big expense for a relatively limited reward. Forty per cent of respondents identified late fertiliser delivery as a serious problem, with another quarter of households calling it a 'moderate' problem. Purchases from agro-dealers and vouchers from FISP accounted for 70–80% of urea and NPK acquisitions, while tobacco companies and agro-dealers were the main sources of CAN and Super D or D compound.

Animal manure presents a potentially cheaper and more readily available source of soil nutrients, and 58% of farmers reported using it in the previous season. Average application rates for those using animal manure was around 2.5 tons in the past season. Ninety-seven per cent of those applying animal manure said they did so from their own sources. We did not gather survey information on livestock ownership but this will be investigated in the follow up studies. Nevertheless, in focus groups women indicated they had a few small stock (goats, pigs and chickens), but not enough to equal the amounts of manure respondents said they applied. According to the chair of one of the local farmer committees, there has been a general decline in animal ownership as government extension services have dwindled and farmers, more in need of ready access to cash since liberalisation, are often compelled to sell their livestock. We will need to investigate further the source of animal manure, given the apparently limited ownership of large livestock.

There was no statistically significant relationship between respondents indicating soil infertility as a serious issue and the amount of fertiliser used. There appears to have been little or no soil testing conducted historically in the areas surveyed, with some farmers not even aware that soil could be tested. Independent soil testing conducted by Chitedze Research Station as part of the research indicated degraded soils across the sites with limited nutrient content and relatively high acidity; the latter favours tobacco over food crops. Recommended remedies are liming to increase pH and the addition of organic content to the soil to improve nutrient content.

For soil fertility, we established the baseline relationship between use of fertiliser (synthetic, animal or green manure) and the food security proxies indicated above. There was a positive correlation between increased levels of both synthetic and organic fertiliser use and the food security proxy measures. However, consideration must be given to the relative wealth (or purchasing power) of households in the first place; households that can purchase larger amounts of fertiliser are also more likely to afford a larger and more varied food basket. We must also consider the broader effects of a net transfer of income away from farming households employing GR technologies, and the impact of this on household food security. Evidence directly contradicts the GR argument that the adoption of these technologies will generate greater incomes and hence food security for farming households.

There was an almost universal consensus among respondents that farming is impossible without fertiliser. Farming households appear to be caught in a cycle of increasing reliance on synthetic fertiliser to squeeze production from the ground on a season by season basis. Synthetic fertilisers generate major ecological problems including soil infertility and damage to water sources. Infertile soil becomes an inert carrier for temporary nutrients that must be pumped in to prop up production. The soil tests conducted by Chitedze Research Station reveal soils that are technically infertile, with very low levels of key nutrients and nutrient holding capacity, despite years of synthetic fertiliser applications. This gives the lie to the argument



that the addition of synthetic fertiliser is necessary for long-term improvements in soil fertility. Indeed, the opposite is the case. Soil renewal, based on increasing organic content to feed soil life as the basis for long-term improvements in plant quality and nutrient uptake, takes a back seat to the short-term solution of synthetic fertiliser application for immediate gain. In their analysis of the research sites, Chitedze soil scientists recommend an increase in organic matter as a key intervention to improve the quality of these soils over time.

The Farm Input Subsidy Programme (FISP)

Three major government input subsidy programmes from 1998 were combined in 2005 to form the FISP, with a focus on providing subsidised maize and legume seed and fertiliser to farmers. The subsidy was withdrawn from cotton and tobacco farmers in 2009. Households benefiting from fertiliser subsidies need pay only MK500/50kg bag (US$1.19) which has a market value of MK17,000 (US$40.48), although they often do not receive enough and purchase additional bags at the full cost. Input distribution under FISP operates on a tender system. In 2014 two parastatals, the Agricultural Development and Marketing Corporation (ADMARC) and the Smallholder Farmer Fertiliser Revolving Fund of Malawi (SFFRFM) won the tenders to distribute the inputs. The private sector benefits from increased market demand and guaranteed markets. Key beneficiaries are the major seed companies: SeedCo, Pannar, Monsanto and Demeter Seed, especially with increased demand for their maize hybrids. The major companies providing fertiliser in Malawi are Farmers World (which also owns Demeter Seed), Yara, TransGlobe, Omnia and Rab Processors (which owns the Kulima Gold agro-dealer distribution network). Forty-four per cent of respondents indicated they had access to FISP inputs in the past season. This was slightly lower in Chamama than in Chipala and Nabuma. In the latter two sites more than half the respondents had received FISP inputs in the past season. However, respondents were concerned that there was little consistency and participation may only be for a single season. Farming households tend to share the inputs with others. The result is smaller quantities of inputs from the programme per household, but a wider diffusion of the technology.
The survey results indicate that FISP in these sites provides access to fertiliser more than to seed. In the past season only 11% of farmers accessed hybrid maize through FISP. It is possible that respondents who indicated they received seed from agro-dealers used FISP vouchers as a contribution. FISP certainly has contributed to the higher use of hybrid maize seed. Prior to the introduction of FISP approximately 43% of farmers in Malawi used hybrid maize. By the 2009–2010 season this had risen to 65%. Our survey indicates that 73% of households used hybrid seed in the last season.

There is widespread recognition that FISP is not an optimal solution. Comments from farmers, farmer support organisations, extension workers and other key informants included the following statements: FISP is politically motivated; it is not good for agriculture despite increased yields; costs and outputs of FISP do not match; there are serious targeting issues; and heavy dependence of the agricultural system on rain means that input subsidies are a wasted investment if the rains do not come. In addition, FISP has been criticised for its expenditure remaining biased in favour of private goods benefiting individual farmers, such as fertiliser and seed, rather than investments in public goods, such as research, rural infrastructure and extension that can beneft farming households collectively. Despite higher yields, most Malawians remain mired in poverty which suggests that the GR package is not delivering meaningful improvements for farmers.

Market access

More than 80% of respondents cited a lack of markets as a serious challenge. This suggests that farmers are keen to increase sales. Yet, in practice, yields are relatively low and most households do not produce enough to meet even their own yearly consumption needs. Market access may mean physical access to distribution and sales points; it can also mean product prices that enable farmers to profit from selling their outputs. The research indicates that the latter is of greater importance than the former. While transport infrastructure was not good in the sites we visited, farmers had a number of possible outlets for the sale of produce. These included local markets, vendors who came to the farm gate to buy, as well as NASFAM and other commercial enterprises who were willing and able to purchase products from farmers.

Essentially, to farmers market access means price. Vendors are widely seen as exploitative, offering low prices and cheating farmers, but because farmers are forced into distress sales to acquire some cash they accept these prices. NASFAM, ADMARC and others offered slightly better prices for some products, some of the time, but the main concern among farmers was that these market outlets were inconsistent; also, when the buyers ran out of money they closed the channel, leaving farmers with no option but to sell for cheaper elsewhere. Respondents observed that market outlets based on value chain financing are disbanded as soon as organisers have bought enough produce to recover the loans given to farmers. One farmer observed that “these markets operate as long as the farmers have not finished repaying their loans, and disappear almost immediately afterwards”.

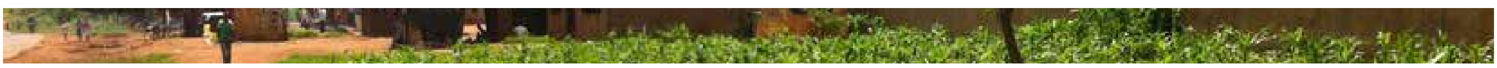
Lack of appropriate storage facilities means that farmers have to sell as soon as the product is ready for harvest. Generally this is at the same time that everyone else is selling, so there is a temporary glut in the market just when farmers are trying to sell. Opportunities for improved producer prices through quality premiums or value addition are limited at present. ADMARC is the only organisation that offers quality premiums but its marketing arm is considered not as efficient as it once was; and it currently purchases more produce from vendors than directly from farmers.

The GR depends on profitable output markets that enable farmers to purchase inputs that benefit the input suppliers, but most participating farmers were not selling significant amounts of produce at all. Tobacco is the only major cash crop in the three study sites and the terms of trade are against farmers, as indicated above. Apart from tobacco, soya was the only crop where more than half of the production quantity was sold, but these were small amounts and this applied to relatively few farming households.

Average maize sales came to just 222kg, with the vast majority selling under 1 ton of maize. Between 62% (hybrid) and 70% (local) of respondents sold 50kg of maize or less. 50kg of maize can be sold for MK3,000 (US$7.14) at local market prices. This indicates that maize is a crop primarily for own use, with distress sales of small quantities to acquire some cash. We already mentioned earlier that the average expenditure on fertiliser inputs alone, amongst the respondent households, was equivalent to the local market value of 1.5 tons of maize. Recouping these costs requires sales of an equivalent amount, aside from production retained for own consumption. The GR proposes to turn farmers into commodity producers who earn cash from the sale of their products and then buy their food needs on the market—but this is not how it is working in practice.

Conclusion and recommendations

Green Revolution interventions, of which AGRA is a leading example, are fundamentally premised on the idea that increased costs of certified seed and synthetic fertiliser can be met by increasing yields. This will allow for increased sales that can generate income for input purchase in the next year, as well as the expansion of farming as a business—to the benefit of producers. However this ‘endless virtuous cycle’ does not appear to have taken root in Malawi. Farming households are purchasing some GR inputs, but realising potential yields requires ideal conditions and these are present nowhere in Malawi. Whether the limiting factors are lack of rainfall, weak soils, lack of appropriate production support, chronic ill-health, lack of access to clean water or other factors, GR technologies will always perform sub-optimally. This means that yields will be lower than potential yields in ideal circumstances. In turn, this means that households must use a greater share of their produce for their own consumption. Finally, this means less available produce for sale and thus lower incomes than are anticipated in the GR theory.



This is borne out in the research: the vast majority of households appear to be caught in a relationship of dependency on GR inputs, in particular synthetic fertiliser. It is apparent that fertiliser and seed prices are very high and are a major concern for farming households. At the same time, households feel the need to use these inputs just to stay in the same place. There may be some yield increases, especially with maize, but the maintenance of these yields requires a continual reliance on and expansion of external inputs, at a long-term ecological cost. Instead of a virtuous cycle of increasing prosperity for farmers, we see a negative cycle based on short-term yield improvements, creating a dependency on these inputs while generating long-term yield stagnation and declining soil fertility. These negative outcomes all reinforce dependency on the GR technologies that contributed to the problem in the first place.

Even if maize yields are higher using GR technologies, the diversity of nutrition and the all-year production of agro-ecological systems give the latter much greater depth. Malawi still has a regular hungry season despite productivity increases in maize. This is related to the production and harvest of a single crop every year.[4] Support for crop diversification and differentiated year round production can extend the range of nutrients available to farming households.

Tobacco company value chain financing and FISP are key mechanisms for propping up this system of production. In the tobacco value chain primary producers are reliant on tobacco production as a cash crop. But producers are clearly in a weak position, relying on buyers to provide inputs while carrying the production risk and receiving only a small portion of value added. Tobacco multinationals are the primary beneficiaries of this system. The multinational corporations (MNCs) are politically very powerful and the Malawian government is reliant on the industry for a large portion of its foreign exchange earnings. However, tobacco as a crop is poisonous—it damages the soil, contributes to deforestation which in turn

leads to soil degradation and increasing CO^2 emissions, and locks farmers into production systems that are not in their long term interests. In essence, tobacco is an anti-social crop and Malawi and other producing countries in the region should consider socially and ecologically just alternative crops and production systems to replace tobacco.

FISP is an essential element in the expansion of GR technologies in Malawi. The programme has increased effective demand for hybrid maize seed and synthetic fertiliser and created a guaranteed market for MNCs in which to profit. FISP has increased the amount of money circulating in and out of the farming system, but farmers are in much the same position as they were before the advent of FISP. Mostly their gains are limited to relatively minor yield increases, with concurrent long-term negative consequences on the ecology. To make matters worse, the money comes in from public expenditure through the subsidies (development aid as well as African governments) and out through private channels (seed and fertiliser companies). Effectively this is public investment for corporate gain, with seed and fertiliser multinationals as the primary beneficiaries of the system.

Green Revolution technologies are making inroads into small-scale farming systems in

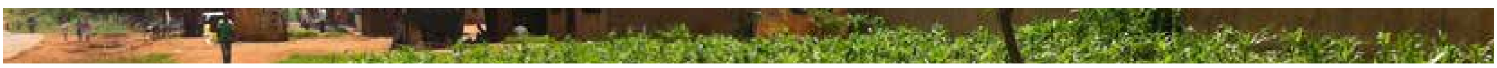
4. Interview, Kristof Nordin, Never Ending Farms, Lilongwe, 5 Feb 2014.

Malawi support from the public and from philanthropic institutions including AGRA. But farming households are engaged in a range of agro-ecological practices that form the material basis within which the GR embeds itself. Conservation Agriculture and Integrated Soil Fertility Management (ISFM) are good examples of a base of agro-ecological practice being used to advance GR technologies. The research indicates that agro-ecological practices are widespread and this offers an opportunity for systematic support to realise a more sustainable and equitable path of agricultural development.

Currently fertiliser is allocated without any knowledge of soil nutrient needs. High levels of synthetic fertiliser are being used and farmers are trapped on the treadmill of dependency. The best solution for this is a gradual weaning process, based on the evidence that other methods of maintaining and improving soil fertility can be effective. Even the proponents of GR recognise the critical importance of adding organic content to the soil, as a fundamental basis for improving fertility, yet they are unwilling to invest in enhancing and expanding these practices.

In agreement with Olivier de Schutter, we propose that input subsidies targeted at individuals should be phased out and replaced with public investment in extension, farmer-based R&D and bulk infrastructure such as water and roads with collective benefit. A key part of public investments in R&D and extension can include: identifying, prioritising and supporting work around participatory plant breeding; participatory variety selection; farmer-managed seed certification and quality assurance systems; identifying and supporting the development of locally important crops on the basis of decentralised participatory R&D; farmer to farmer exchanges; identifying and expanding the means of increasing organic content in the soil; an orientation to nurturing soil life as the basis of soil fertility, or soil health programmes: and support for agro-ecological methods of soil improvement and water retention. In addition, work on nitrogen fixing trees and food trees could advance soil fertility and food security agendas.

Thus far research has shown that while AGRA programmes are having a relatively small impact on the three study sites so far, AGRA contributes significantly to the broader GR thrust. Follow up research will focus in more detail on NASFAM's pigeon pea programme and other seed related issues, on the CNFA-supported agro-dealer networks and on monitoring and analysing the interventions of the SSTP.



INTRODUCTION

In early 2014 the African Centre for Biosafety (ACB) launched a multi-year research programme in southern and east Africa to investigate seed and soil fertility practices and the challenges and opportunities facing small-scale farmers in these regions. Central to this is to investigate in more detail the activities of the Alliance for a Green Revolution in Africa (AGRA), an institution that plays a critical coordinating role in expanding the Green Revolution (GR) on the continent. This includes its central roles in facilitating various activities of the G8's New Alliance on Food Security and Nutrition (NAFSN), the US government's Feed the Future (FtF) initiative, Grow Africa and others which, working through the African Union's (AU's) Comprehensive African Agricultural Development Programme (CAADP), are pushing for the introduction of GR technologies.

The GR push in Africa takes the form of public-private partnerships (PPPs) to develop and distribute technologies to generate profitable input and output markets for agricultural products. It is based on hybrid seed, synthetic (factory-produced) fertiliser, sometimes irrigation and sometimes private land title, interest-based financing and profitable markets for outputs. While some African farmers may benefit from this we are interested in looking beyond the narrow top layer, to consider the various consequences for those who will not benefit, and may even stand to lose—for example, through losing access to land or rights to land they depend on for their livelihoods. ACB has a dual focus of analysing and critiquing the GR thrust while also identifying and elaborating on ecologically and socially just and sustainable alternatives.

For the GR, 'improved' seed is synonymous with registered and certified seed produced through a laboratory. At most, lip service is paid to generating and sustaining seed improvements from within the farmer-managed seed system. A farmer-managed seed system can be defined as incorporating any seed that is not produced or distributed through certified, regulated channels for at least one season. This may include recycled hybrid seed, although we

need to investigate this further. Farmers do recycle hybrids, especially of maize, and this seed either adapts to and finds a niche in the ecology or passes out of use. Farmers also recycle 'improved' open-pollinated varieties (OPVs), especially legumes. Throughout this report, 'improved' seed refers to GR certified seed since that is what AGRA and other GR proponents mean when they talk about improved seed. However we must keep in mind that seed can also be improved through farmer-managed systems, and we want to be on the lookout for such cases and elaborate on them, together with our partners and participating farmers.

There are issues regarding the changing character of the socio-ecological niche defined as "the convergence of agro-ecological, socio-cultural, economic and ecological factors, to describe a multi-dimensional environment for which compatible technologies can be predicted" (Ojiem, et al., 2006:79). The extent to which GR technologies are transforming these niches is evident in Malawi, and manifests in high levels of dependency on synthetic fertiliser and hybrid seed. At the same time, longstanding social and economic systems are tenacious. There are three basic approaches to this persistence. On the one hand, the GR says these systems are obsolete and must be replaced with a profit-based system as the only guarantor of food security. AGRA explicitly calls for a "transformation" of African smallholder farming systems towards so-called modernised production techniques and systems of governance. On the other hand,

food sovereignty and agro-ecology advocates argue that the tenacious local systems that have supported life and society in difficult circumstances, for millennia, are essential to a balanced future that allows for social wellbeing as well as adaptability to ecological changes. However, agro-ecology does not simply hark back to a romanticised past, but is an applied science (Altieri, 1995). A third approach argues that some kind of blending between the GR and pre-existing systems and technologies is possible, the best of both worlds. This is the view, for example, of Integrated Seed Sector Development (ISSD) or Integrated Soil Fertility Management (ISFM). The research aims to explore some of these issues and their impacts on farmer livelihoods and the socio-ecology.

We have framed the research with small-scale farmers at the centre, investigating possible impacts and consequences of the adoption of different technologies in a dynamic and changing environment. ACB worked with membership-based farmer organisations (FOs) and farmer support organisations (FSOs) to conduct the research. ACB is part of a continental network called the Alliance for Food Sovereignty in Africa (AFSA). FOs, FSOs and non-government organisations (NGOs) are part of this network, and we intend to work with this alliance to develop the research over time and build regional linkages between farmers and FOs. The research aims to contribute to building this network and to share information between FOs and FSOs about practical ways to strengthen farmer-managed food production systems.

ACB has chosen to focus on seed and soil fertility as entry points into broader debates about agricultural development and farmer support in Africa. This is partly a result of our historical work on seed, but is also based on recognition of the tight interconnections between seed and soil fertility technologies. Seed and soil fertility are high on the agenda of governments and private companies as efforts are made to increase agricultural productivity in Africa. Although the goal of increasing productivity is widely accepted, the methods for reaching this goal are highly contested.

African governments have a contradictory approach to these questions. Apropos seed, there is a general acceptance among policy makers that 'improved seed' means hybrid seed. Efforts are mostly concentrated on a few key crops (maize, some legumes, and specialised crops, e.g. tobacco, cotton) where commercial (for profit) involvement may be feasible in the current market context. At the same time, there is a recognition of the ongoing importance of farmer-managed seed systems (also called informal seed systems) in ensuring farmers have access to quality seed for planting. AGRA's approach to seed is primarily a GR approach that focuses on hybrid seed with some lesser work on legumes. AGRA emphasises yield increases and is playing a key role in developing systems and capacity to produce and distribute certified seed in Malawi.

Unfortunately, regional seed harmonisation processes underway do not do justice to the complex interactions between commercial and farmer-managed seed systems, and tend to impose solutions that suit the commercial system, often at the expense of farmer-managed systems (for example through criminalising farm-level seed saving and sharing), even though this is not entirely necessary. This is a tangible manifestation of the GR agenda which is based on a belief that farmer-managed systems of production and distribution are obsolete or of no consequence. This blanket imposition of standardised solutions has sparked resistance among FOs and FSOs. It has also led to the search for a systematic elaboration of alternative seed production and distribution systems that place farmer interests ahead of the profit-making interests of MNCs.

The same contradictions apply to soil fertility. CAADP, which is the primary instrument for agricultural policy development on the continent, has an entire pillar dedicated to sustainable soil and water management (AU, 2009). This pillar recognises a wide range of agro-ecological soil fertility measures alongside a call to increase the use of synthetic fertiliser. The AU has also passed resolutions calling for efforts to increase average synthetic fertiliser use across Africa to 50 kg/ha by 2015 (AU, 2006), and resolutions calling for work to be done on building organic agricultural practices in Africa (AU, 2011). As with seed, the emphasis in practice tends towards promoting synthetic fertiliser use at the expense of developing and deepening organic soil fertility practices. ACB has accompanying work that explores the expansion of the fertiliser industry in Africa (ACB, 2014a).

Concerning both seed and soil fertility, there is some work being done on ways of integrating commercial and farmer-managed systems. For seed, the most advanced approach in this regard is the Wageningen-led ISSD approach (Louwaars and de Boef, 2012), while soil fertility conservation agriculture (CA) and ISFM (Alley and Vanlauwe, 2009) are approaches that aim to blend different methodologies. AGRA has adopted ISFM as its core conceptual framework for its soil health work (AGRA, 2007). We are interested in investigating these methodologies further to identify their possibilities and limits.

However, the GR package of hybrid seed, synthetic fertiliser, irrigation, private land title and interest-based financing has a logic of its own, and there is no guarantee that this technological package can be blended. The material social and ecological impacts of the full or partial introduction of this package on farming households and the wider society must be scrutinised. An agro-ecological approach eschews the use of these technologies and proposes that farmer-managed seed systems and organic soil fertility methods can produce required productivity increases without these external interventions. For the purposes of this research, we are defining agro-ecological practices broadly as any production practices that emphasise farmers' direct control over technologies used on the farm, methods that increase the health of the soil measured by greater water retention, beneficial soil life and increased organic content in the soil, and the use of indigenous knowledge and seed systems that favour direct farmer control wherever possible. From a food sovereignty point of view, it is important to add that these should be situated in a framework of collective ownership and democratic decision-making. By this definition, proprietary technologies that extract value from farmers cannot be part of a food sovereignty solution.

ACB views agro-ecology as one link to the broader food sovereignty framework as a socially just and ecologically sustainable base for food production. A scientific approach requires that we also test these claims. Nevertheless, we must also understand that the skewed allocation of public and private resources towards GR technologies, at the expense of research and development (R&D) and resourcing for agro-ecological technologies, can make it appear that GR technologies are superior. This needs to be countered by looking for ways to resource and practically support technical agro-ecological methods so a fairer comparison can be made. This research agenda undoubtedly leads to some complexity as we attempt to blend social, economic, political, ecological and technical analysis, and as different technological tools and techniques are differentially adopted. Our fieldwork in Malawi, elaborated in this report, indicates some of this complexity.

METHODOLOGY

Background to the research

This research developed out of ACB's thinking about how to track the Green Revolution in Africa, with a focus on AGRA as a pivotal institution in the process. We selected seed and soil fertility as priority issues to explore. Seed is an historical focus of ACB's work, emerging from opposition to the introduction of genetically modified (GM) seed in Africa. Soil fertility is a new addition which allows us to approach questions of agro-ecology, food sovereignty and GR from various angles. Seed and fertiliser are two key inputs in the GR push in Africa.

The research is part of a multi-country and multi-year project, with Malawi as the first country to be studied. Malawi was selected because of its GR and AGRA projects and the presence of a mass-based farmer organisation, NASFAM, with whom ACB has had previous interactions around seed.

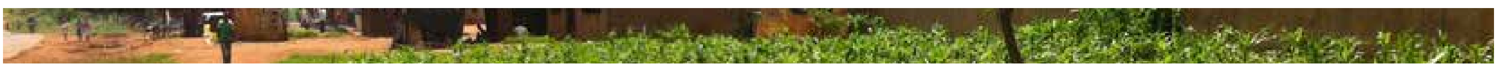
ACB started with a scoping study to acquire background information about Malawi, covering political and economic profiles, agriculture and land, seed and soil fertility, AGRA's role in the country, and a list of people to speak to including potential research partners. We conducted a scoping visit in early 2014 in which we met with various stakeholders, including government departments, NGOs and civil society organisations (CSOs), FOs and FSOs, the new AGRA country representative, the Seed Trade Association of Malawi (STAM), the United Nations Food and Agriculture Organisation (FAO), the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), the Chitedze Research Station, universities and research institutes, and others.

Our initial plan was to compare GR and non-GR sites to see what differences could be attributed to production technologies and practices. But as we met with organisations, especially Kusamala Institute of Agriculture and Ecology (Kusamala) and Never Ending Food, we thought it would be valuable immediately to incorporate an agro-ecological alternative as part of the research. This stretched the research, but thanks in large part to Kusamala already having done a baseline survey in Nambuma in Dowa district, as part of research they had already started, we managed to incorporate three sites.

We have discovered, during the research, that there is not such a clear distinction between GR and non-GR farms or farmers. Many basic practices are the same, with a surprisingly high number of farmers using some agro-ecological techniques. There is uneven uptake of hybrid seed and synthetic fertiliser. Many farming households rely heavily on subsidised certified seed and synthetic fertiliser inputs, while still practicing a range of techniques that can be considered to conform to our definition of agro-ecology. However, some households get a partial package (including cases where inputs are shared or sold between households), which both spreads GR technologies and also dissipates their effect, as they blend with other existing technologies and practices or disappear altogether. Sometimes farmers may use these inputs in one season and not in the next, for reasons that include affordability, availability and choice. So there is a hybridisation of production practices themselves. GR is unevenly absorbed into the technological space, with complex and uneven impacts.

The aim of the research is to examine the material impacts of these developments on households and their access to food, on distribution of economic assets, on the soil and ecology, but also on the possibilities for alternative ways of producing and distributing food, based on collective ownership, solidarity and democratic decision-making.

We used a survey based heavily on a shortened version of Kusamala's excellent baseline survey, with additions from NASFAM surveys and a few alterations from ACB. A survey allows for a measurable baseline, whatever the weaknesses of surveys as a recording instrument may be. Surveys can provide a snapshot, but to untangle and explain the relationships between variables requires qualitative research work. In early 2016 we will return to the same respondents, ask them the same questions and begin to track changes, analyse potential



reasons for changes, and develop appropriate responses together with partner organisations and farmers. In the meantime, we will work with participating farmers and our partners to see what practical work we can do.

In Malawi, we partnered with NASFAM and Kusamala, engaged also with Chitedze Research Station and will work with the Civil Society Agriculture Network (CISANET) and others for dissemination. We also worked with Dr Blessings Chinsinga from the University of Malawi. Kusamala is a local NGO providing specialised training in permaculture and agro-ecology, education and outreach, research and evaluation, as well as demonstration and advocacy. It oversees Nature's Gift Permaculture on 20 ha of land and is the largest demonstration centre for permaculture and agro-ecology in Malawi. Kusamala encourages and works with researchers to conduct research on permaculture and agro-ecology and to show how these approaches work, but also to show where technologies are not working. Kusamala works in rural communities and trains farmers in agro-ecology. It currently works with 1,500 farmers in clubs of 15–20 members in Dowa district, and 15,000 farmers located in different irrigation schemes in the districts of Mzimba, Thyolo and Nsanje, through associations with partners.

NASFAM is a membership-based organisation with an estimated 100,000 members. The smallest operational unit is the club, comprising 10–15 individual farmers (though some clubs may be bigger than this). Clubs combine to form action groups that are key points for the dissemination of information to members and the aggregation of member crops. Action groups combine to form NASFAM associations, which are legally-registered entities, member-owned, and managed by farmer boards (Chirwa and Matita, 2012).

Participating farmers in Kasungu were mostly NASFAM club members, with discussion during semi-structured interviews revealing a fairly even gender balance in club membership, though many clubs have a dearth of members under 35 years old. This could reflect a growing trend of youths migrating away from agriculture in search of other employment

opportunities. At Chamama, farmers said youth were involved in agriculture, but they did not belong to organisations or attend meetings because they see them as a waste of time. Club membership is secured by a minimum purchase of club shares (5 shares at MK 200 each is a common figure). Most clubs meet at least once a week, implying a level of functionality.

There was an overall feeling that being a club member secured certain benefits, mostly in the form of accessing information and loans (mainly cash and seed). Some farmers reported receiving goats through their club membership, while others are pooling resources to improve access to irrigation.

NASFAM has a very impressive strength of organisation, with a smoothly functioning system from national to farm level, from what we observed during the research process. Kusamala, established in 2009 as an experimental permaculture farm and training institute with an outreach programme, has a trove of knowledge about agro-ecological practices, with the capacity to share this practical knowledge. There is a lot of commonality in approaches with farmer interests placed at the centre of interventions. Dr Chinsinga from Chancellor College at the University of Malawi provided academic rigour and political analysis based on a deep understanding of the context.

Process and methodology design

ACB drafted a research design which was discussed and developed collaboratively with partners at a research team meeting in Lilongwe in March 2014.

Selection criteria

The sample was selected and stratified as follows:

In an area where partners are active: They should be part of a community where existing programmes being run by partner organisations are taking place. We targeted 30 participants per site in three sites—Chamama, Chipala and Nambuma. Kusamala had already conducted a larger baseline survey in their site and we built on that.

Range of production practices: Selection aimed to include farmers using different production methodologies with the objective of comparing between conventional agriculture, CA and agro-ecology. We sought a mix between those who are part of partners' programmes and those who are not. The picture revealed by the survey shows us that these categories are very blurred, since information does not travel only through formal channels, and practices learned by some are spread to others living in the same area.

Gender: We sought at least 50% women respondents. The results of the survey show an even split among respondents (45 women, 46 men, out of 91). We recognise that respondents are part of a household, and that most households are male-headed (85% in our survey). A much larger survey conducted for AGRA in 2010 found that 22.5% of overall households were female-headed, and the figure was 19% for the Central Region (Jimat Development Consultants, 2012:19). The data is not individual data that can be ascribed to the gender of the respondent, it is household data. We may need to consider the possibility of an even split in the selection process for the gender of a household head, recognising that most households are headed by men, which will make the gender ascription to production practices, nutrition and land access far more solid. We are not in a position to delve into intra-household gender dynamics at this stage, not least because it is intrusive on people's private lives. We will need to have ongoing reflection and discussion about how best to identify specific gender issues around production and consumption as our research unfolds.

Youth: We aimed for 50% youth (both men and women), with the youth category considered anyone aged 35 or younger. Despite this, only 30% of our respondents were under 35. As mentioned above, this could be a lack of involvement in agriculture or a lack of involvement in organisation. Whatever the reason, there is the same methodological problem as with gender, in that youth do not represent their own individual production, but rather household production. So we must bear in mind that the household is the basic unit of production, with a division of labour within the household.

Site selection

Following our initial research design meeting, we conducted site visits with our partners. NASFAM selected two sites—Chamama and Chipala—in Kasungu District, about 130 km north of Lilongwe (Figure 1) in the Central Region. NASFAM selected these sites based on their participation in its CA programme. Kusamala selected Nambuma in Dowa District, which is the site of a two-and-a-half year programme with 400 participating farmers implementing climate smart agriculture. This includes community mapping and participatory monitoring and evaluation, recorded on film. Kusamala had already conducted a baseline survey at the end of 2013 and we built on this for our survey. Dowa is north of Lilongwe but before Kasungu (Figure 1); Nambuma is around 60 km away from Lilongwe.

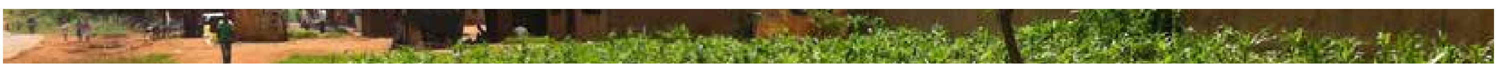
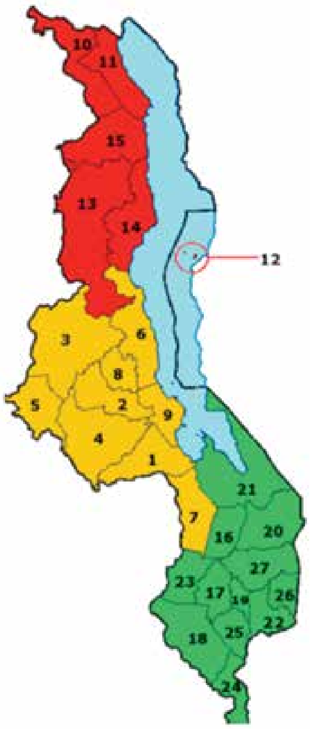


Figure 1: Districts of Malawi



Lilongwe=4, Dowa=2, Kasungu=3
Source: https://en.wikipedia.org/wiki/Districts_of_Malawi

Research tools

We used a **combination of research methods:** a baseline survey, semi-structured interviews and focus group discussions (FGDs) with farmers; key informant interviews (KIIs) during scoping and during the fieldwork with NASFAM staff and agro-dealers; and soil testing, which arose during the research as a potentially useful scientific base for doing soil fertility work. We contracted Chitedze Research Station for technical support on soil testing.

We adopted a ***multi-disciplinary approach*** that embraces both physical and social technologies. Physical technologies are defined as "methods and designs for transforming matter, energy and information from one state into another in pursuit of a goal or goals" (Beinhocker, 2007:244). Social technologies are defined as "methods and designs for organising people in pursuit of a goal or goals" (Beinhocker, 2007:262). This was an experimental methodology, the first effort in the research programme, and lessons from the experience will shape further work in Malawi and in other countries where research will be conducted.

Soil testing is a first step in a scientific assessment of what measures need to be taken to improve soil fertility. Despite this, and the fact that large amounts of fertiliser are being introduced into these areas, basic soil tests had not been conducted prior to these interventions. Of course it is very expensive to cover many small plots and pieces of land, and soil testing in a corporatised world will work only with economies of scale and where the cost can be covered as part of the costs of production. This means commercial farming. For other farms, it will be valuable to identify and implement intermediate soil testing technologies that can be applied by farmers themselves, and that may be able to provide certain crucial information such as pH, organic content, and soil life and water retention measurements. There may be limits to what can be gathered by farmers themselves, and a laboratory-based soil analysis would give a very valuable baseline, even if follow up work measures only a few key variables in the short term, using methods that farmers and FOs can apply. But even where farmers can carry out basic tests themselves, there is still the need for quality control and input from the formal R&D system. We will take this issue forward in the course of the research, to see to what extent lab-based soil analysis adds value for farmers, how farming households might become more actively involved in soil testing and analysis, and what methods are locally available to remedy identified nutrient imbalances in the soil.

The ***survey*** consisted of 20 questions covering demographics, nutrition and food security, production and yields, land, key challenges, production practices, soil fertility and seed, with 30 participants in each site. Partner organisations selected the participants. In the few places where our survey differed from Kusamala's original baseline, Kusamala gathered the additional information from the 30 selected farmers. Since we were trying to keep the survey as short as possible, we omitted livestock ownership. This will be included in forthcoming research, since a key aspect of agro-ecological approaches to soil fertility is the use of animal manure. Kusamala

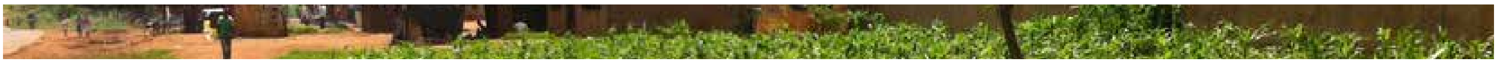
has data on this from their survey. We will include a question on this in a follow-up survey, as well as including it from the outset in the surveys in other countries as part of this research programme.

The semi-structured interviews attached to the surveys were too onerous and we will drop them from the next round of research. Instead, we will use ongoing FGDs with farmers for discussion and reflection.

The survey results were entered into a ***database*** using SPSS and, following the survey, an initial run of results was made using the Kasungu data only (we had not yet finalised the integration of Kusamala's 30 cases). The research team met in June and discussed the results and research process, and developed an action plan for writing this report.

The research will feed into ongoing processes of reflection, investigation, documentation and action. A draft report was produced and circulated, and farmer reportbacks were held in each site to share the results, verify and discuss them, consider implications, and identify priorities for further research. This may include resourcing farmer-to-farmer exchanges, specifically on issues of seed, soil fertility, agro-ecology and food sovereignty.

The mean age of respondents in the survey was 43 years old. Thirty per cent were below 35 years old, 61.5% were between 36 and 60 years old and the remaining 9% were over 60. The respondents were evenly split between men and women. Average household size was 6.24 people, slightly skewed towards males and towards people over 14 but not significantly so.



CONTEXT

The Green Revolution push in Africa

Though Africa is usually described as having 'missed' the original Green Revolution of the 1960s and 1970s, attempts were made to replicate this model on African soil at the time. The Consultative Group on International Agricultural Research (CGIAR) established several research centres including the International Institute for Tropical Agriculture (IITA) in Nigeria (1967), the West Africa Rice Development Association, now known as the Africa Rice Centre, in Benin (1970), and the International Council for Research in Agroforestry (ICRAF) with headquarters in Kenya (1978) (Dano, 2007). Agriculture in Africa suffered following the onset of structural adjustment in the 1980s which called for state expenditure to be replaced with development spending (with the implicit assumption that the private sector would eventually fill the vacuum). However, the effectiveness of the increased flow of development funding depended to a large degree on the capacity of the state to channel it to the ground, capacity that was no longer there (ACB, 2012).

After a lengthy hiatus, agriculture began to re-emerge as a leading issue on Africa's development agenda from the late 1990s. Two highly influential publications, *The Doubly Green Revolution: Food for All in the 21st Century* written by Gordon Conway and *Securing the Harvest* by Joe Devries and Gary Toennissen, were released around this time and contributed to a burgeoning dialogue around a 'uniquely African Green Revolution'. Both books acknowledged that Africa's highly varied agro-ecological conditions and the absence of a well-resourced class of farmers ready to adopt the technological package were significant in the apparent failure of the GR to flourish in Africa. That the over-riding logic of the GR remained unquestioned in either publication is hardly surprising, given that all three authors had strong links to the Rockefeller Foundation which supported the CGIAR institutions historically. Conway assumed his post as president of the Foundation shortly after The Doubly Green Revolution was published, while Devries and Toennissen also had long

associations with the Rockefeller Foundation, and both were highly influential in AGRA's formation (ACB, 2012).

This shift in thinking in the development community coincided with political shifts in Africa itself, which saw the Organisation for African Unity (OAU) morph into the African Union (AU). A corollary of this was the creation of the New Economic Partnership for Africa's Development (NEPAD), seen by many as a vehicle to re-position Africa within the global economy by making it a more attractive destination for foreign direct investment (Kolavalli, et al., 2012). Though it is presented as being a purely technical concept, the 'modernisation' agenda implied in the new GR push in Africa is a good fit with the continent's new political and economic orientation. It is intrinsically connected with commodification; i.e. the conversion of processes of production into conduits for the expansion of capital. Standardisation, whether of farming inputs, agricultural produce or storage and packaging, is a pre-requisite for this process (ACB, 2013).

Discussions about an African GR began in earnest in the late 1990s, at a time when The Economist infamously referred to Africa as 'the hopeless continent'. A decade of steady if highly uneven GDP growth across the continent, booming commodity prices and Africa's so-called impending 'demographic dividend' (i.e. a 'middle class' that is expected to exceed India's in number by 2020) (ACB, 2014) all contribute to a new 'Africa rising' narrative. This trend was characterised by the Africa Rising: Building

to the Future conference, hosted by the International Monetary Fund (IMF) in Maputo in May 2014. Land and agricultural production, together with the recognition that the world is entering a period of structurally higher food prices, have all become important avenues for profitable investment (ACB, 2012: 8).

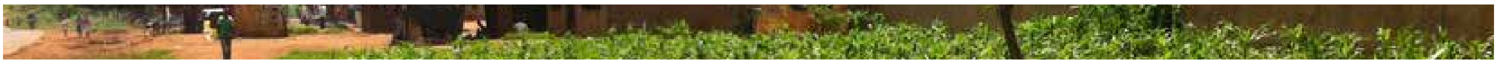
There are two distinct (though in some instances overlapping) sides to these new agricultural investments: the production and export of raw materials and the building of local and regional markets. Leaving out the large land deals purely for export, other large-scale initiatives, such as the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) and the Beira growth corridor in Mozambique, point towards a clear convergence between the two. SAGCOT, for example, encompasses vast areas of southern Tanzania deemed not only to have high agronomic potential, but which also sit on the country's principle infrastructure corridor from the port of Dar es Salaam to the borders of Malawi and Zambia.

The issue has been further clouded by the emergence of the Grow Africa platform and the G8 New Alliance on Food Security and Nutrition (NAFSN). Both these endeavours emerged from a meeting of the World Economic Forum (WEF) in 2010 in Davos, Switzerland, at which seventeen companies presented the Roadmap for Stakeholders, describing a new vision for agriculture in Africa. Grow Africa was launched with sponsorship from the WEF, the AU Commission and NEPAD and is closely linked to objectives and targets championed by CAADP. Explicit overtures to CAADP have enabled companies operating under Grow Africa to claim the process as an 'African-owned process' (McKeon, 2014). Grow Africa and NAFSN are explicit in their vision of what the GR in Africa should produce: high-input, high-output production involving major transnational corporations with an emphasis on exports.

AGRA is playing a pivotal role in facilitating the GR in Africa. Its influence is wide-ranging, from coordinating the newly-launched Scaling Seeds and Technologies Partnership (SSTP) under NAFSN, to running the Farmer Organisation Support Centre in Africa (FOSCA), to providing resources to build technical knowledge in the areas of seed and soil science in universities across the continent, to holding regular fora to influence government and donors on the way forward for the GR, to supporting individual seed companies and agro-dealers to become profitable commercial entities. The GR is much larger than AGRA, but the latter is a key institution in Africa holding the framework together and coordinating activities and initiatives.

As part of its strategy, AGRA works closely with institutions under the umbrella of the Consultative Group for International Agricultural Research (CGIAR), such as ICRISAT and the International Centre for Tropical Agriculture (CIAT). The Rockefeller Foundation, historically a major sponsor of CGIAR institutions globally, is a co-founder, with the Gates Foundation, of AGRA. One of AGRA's key strategies is to use germplasm in the public domain to develop improved seed varieties. From a plant breeding and seed development perspective, national governments across Africa are heavily reliant on CGIAR institutions for technical expertise.

Like the other GR initiatives such as the G8's NAFSN, FtF and Grow Africa, AGRA works explicitly through CAADP and thus government agendas. All these initiatives are very careful to work through continental, regional and national government processes. CAADP has its internal contradictions and tensions; for example, it explicitly embraces a modernising GR approach to agriculture but at the same time recognises the importance of long-standing ecological practices and social cohesion. The GR thrust selectively embraces CAADP, pushing private profit-driven involvement, proprietary technologies, economic consolidation (e.g. economies of scale, private ownership of land and consolidation into larger units) and limiting the public sector where potential for private profit is identified. Although the logic is that the public sector does not have sufficient resources of its own and requires private sector resources to realise CAADP goals, the cost of working through PPPs is the diversion of public resources to support the interests of private companies.



In our study sites, the GR manifests in the high use of synthetic fertiliser and hybrid seed (especially maize, but also improved seed of other crops) channelled through corporate and small scale agro-dealers. It is also evident in the contract farming model through which tobacco production is supported. Membership-based farmer organisations such as NASFAM, with whom we partnered in this research, also have their origins in GR initiatives—in this case via USAID looking for ways to increase tobacco production in the 1990s. In these ways the GR has a heavy presence in the research sites but, as we will see, farming households also embrace other methods of production, sometimes by choice and sometimes from necessity. It will become clear that although the GR may increase yields for some crops to some extent, the socio-economic conditions for the majority of farmers remain abject. To blame this on the failure to embrace GR technologies is a gross simplification, especially where these technologies have been embraced with limited positive impact for farming households. The main beneficiaries are the corporate seed and fertiliser companies and their agro-dealer networks.

Overview of agriculture in Malawi

Agriculture remains the backbone of the country's economy despite concerted efforts to diversify it over the last five decades, since the attainment of independence in July 1964. It is estimated that 85% of the country's population depends on agriculture for their livelihoods; contributes 39% to the country's Gross Domestic Product (GDP); accounts for 85% of total employment; and contributes over 90% of the country's export earnings (Chirwa, 2008; Kachule, 2011; Chinsinga, 2012). According to the Government of Malawi (2012), agriculture accounts for 74% of all rural incomes. These statistics underscore the fact that Malawi's economy is driven substantially by the agricultural sector. When the agricultural sector prospers, the economy prospers too and when it tumbles, the economy tumbles too.

The current status of the agricultural sector cannot be understood without taking into account the enduring dualistic structure of the country's agricultural sector (Chirwa, et al., 2008; Kachule, 2011). The agricultural sector comprises the smallholder and estate sub-sectors that were passed over from the colonial administration almost wholesale at the time of independence. There was no meaningful attempt to alter the configuration of the agricultural sector at independence, which has had significant impact on the performance of the agricultural sector both in a historical and contemporary context.

The estate sector, comprising farms starting from a minimum of 10 hectares and held under either freehold or leasehold, specialises in the production of cash crops such as tobacco, tea, coffee and sugar; whereas the smallholder sector cultivates under customary tenure and specialises in the production of food crops, mainly maize, cassava, sweet potatoes and legumes such as groundnuts, soya and beans (Kachule, 2011). Tobacco is also produced in the smallholder sector, as this report shows. Recent estimates indicate that the smallholder sub-sector contributes more than 70% and the estate sub-sector contributes less than 30% to GDP originating from the agricultural sector. The smallholder agricultural sub-sector produces more than 70% of the total food produced and contributes about 20% to agricultural exports (Chinsinga, 2012).

We need to find a common definition of smallholder. In South Africa, the definition of gross turnover works quite well, in a commercial context. Anyone below a threshold (in South Africa R300,000 turnover/annum (Kirsten, 2009) is considered a smallholder. This will necessarily include anyone not incorporated into the tax net. In Malawi this will be the majority of producers, perhaps even among market-oriented farmers. The definition of a smallholder farmer in the Malawi context has not been determined. Chirwa and Matita (2012) recognise that smallholder farmers in Malawi are not a homogenous group. They are a diverse set of households with varying farm and household characteristics. The distinction between smallholder and estate sub-sectors on the basis of landholding sizes does not work well, as established in this study. Several households classified as smallholders reported landholding sizes in excess of 4 ha. In this regard, Chirwa and Matita (2012) defined a smallholder farmer as one who usually

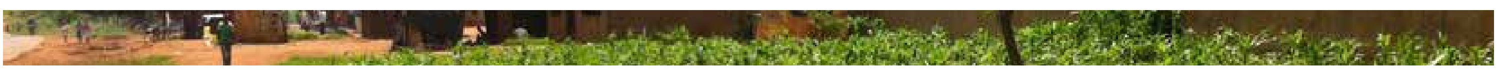
cultivates less than a hectare of land producing 60% food and 40% cash crops and uses a hand hoe as their main tool for farming activities.

Although the agricultural sector seems diversified in terms of crops grown, maize remains the dominant crop cultivated. It is estimated that maize occupies about 80% of cultivated land in the smallholder sector (Kachule, 2011). This is further reinforced by Denning et al., (2009) who observed that maize is grown by an average of 97% of farming households and accounts for 60% of the total calorie consumption. It is argued that Malawi has the highest per capita consumption of maize in the world (Hassan, et al., 1996; Chinsinga, 2012). In our survey we found around 1.5 tons per household on average. This is not very surprising because food security is defined mainly in terms of access to maize (Mwase, et al., 2013). Recent data from the Ministry of Agriculture and Food Security (MoAFS) show that the combined growing area of other staples like rice, sorghum, millet, cassava, and sweet potatoes does not reach even one-third of that of maize. Our own survey produced similar findings.

The smallholder sub-sector faces serious land constraints to ensure viable agricultural production. Chirwa, et al., (2008) observed that owing to population pressure the national mean landholding size declined from 1.53 hectares per household in 1960 to 0.80 hectares per household in 2000. It is estimated that about 25% of smallholders cultivate less than 0.5 hectares, 55% less than a hectare; 31% between 1 and 2 hectares and 14% more than 2 hectares. In our survey, average land owned was 1.5 ha with three landless households, and 15–20% of households owned above 4 ha of land.

However, the main factor that has contributed greatly to the worsening land situation in the smallholder sub-sector is the 1967 Land Act. As noted above, prior to the enactment of the 1967 Land Act, land in the smallholder sector was plentiful, except in those areas where the colonialists had appropriated huge tracts of land predominantly for plantation agriculture. During this period commercial agriculture was practiced entirely by the white settler farmers. The major problem with the 1967 Land Act is that it allowed for the one way only transfer of land, from the smallholder sub-sector to the estate sub-sector, usually at very modest compensations. This means that prior to the 1967 Land Act vast tracts of land were owned under customary tenure and controlled by traditional leaders who distributed portions to those who came looking for land on which to settle and cultivate. The main goal of the 1967 Land Act was to rectify some defects that stood in the way of efforts to modernise the country's agricultural sector. In introducing the 1967 Land Act the President argued that "… existing customs of holding and tilling were outdated, wasteful and totally unsuitable for the development of a country with agriculture as the basis of the economy" (N'gon'gola, 1982: 115). The President further justified the reforms by pointing out that the main problem with customary land was the lack of clarity regarding ownership since "… no-one is responsible … for the uneconomic and wasteful use of land because no-one holds land as an individual. Land is held in common …. and everybody's is nobody's baby at all" (ibid.).

Consequently, huge expanses of land were appropriated from the smallholder sub-sector, fuelling dramatic growth of the estate sub-sector in the 1970s and 1980s (Kanyongolo, 2005). Thus, as a result of the 1967 land reforms,



land was construed as a commodity to be governed by market forces. This encouraged entrepreneurs to acquire portions of communal land and convert them into their own private lands. There are reports that in cases of resistance force was used to move smallholder farmers off land that had been leased to the estate sub-sector. According to Kachule (2011), there are currently 26,000 farms in the estate sub-sector, occupying a land area of about 1.2 million hectares of which 25% is cultivated. The massive land alienation, amounting to over 1.3 million hectares over a three-decade period from the smallholder sub-sector, has eventually produced three categories of smallholder farmers: 1) larger smallholder farmers that make up about 14% of the total smallholder farmer population, with enough land to produce surplus; 2) 31% of smallholder farmers with enough land to produce sufficient food to meet their own requirements, and who could potentially become surplus producers; and 3) 55% of chronically food deficient households for whom improved policies and technologies could enhance food security.

The livestock sector is not very well developed yet it is widely recognised that it has significant potential to contribute to the country's economic growth and people's livelihoods in terms of food security and nutrition (Chirwa, et al., 2008; Kachule, 2011). It is estimated that the livestock industry contributes about 7% to the national GDP and about 12% of the total agricultural productivity. The sector comprises mostly ruminants such as cattle, goats and sheep, and monogastrics such as pigs and chickens, and provides for both subsistence and commercial requirements. Chirwa, et al., (2008) argues that the poor performance of the livestock sub-sector is partly a reflection of the lack of emphasis within agricultural strategies and policies towards the sector. The poor performance of the livestock sector is attributed, inter alia, to inadequate improved breeds; prevalence of disease and parasites; high costs of manufactured feeds; and high incidents of livestock theft. Integration of livestock into farming systems is critical from a soil fertility point of view, since adding organic content to the soil will improve soil life and soil quality.

The agricultural sector in Malawi has not done particularly well since liberalisation reforms in the 1990s. These reforms included: the closure of uneconomic state marketing facilities; liberalisation of the marketing of smallholder crops; public expenditure restructuring; liberalisation of fertiliser importation and marketing; removal of subsidies; liberalisation of burley tobacco; and adjustment of estate rents (Chinsinga, 2012). Smallholder farmers marginalised in these processes experienced a significant positive turnaround only after implementation of FISP in the 2005/06 growing season (Chinsinga, 2007; Chirwa, et al., 2011; Kachule, 2011). The implementation of FISP followed negative reviews of the impact of liberalisation on the agricultural sector. According to Chilowa et al., (2000) the liberalisation of the agricultural sector inflicted heavy social burdens on vulnerable segments of society, mainly because its design did not take into account the potentially adverse effects on the poor in the short and medium term. The liberalisation of the agricultural sector led to dramatic changes in the nature of the agricultural sector which, until then, had at least guaranteed food security among the smallholder farmers.

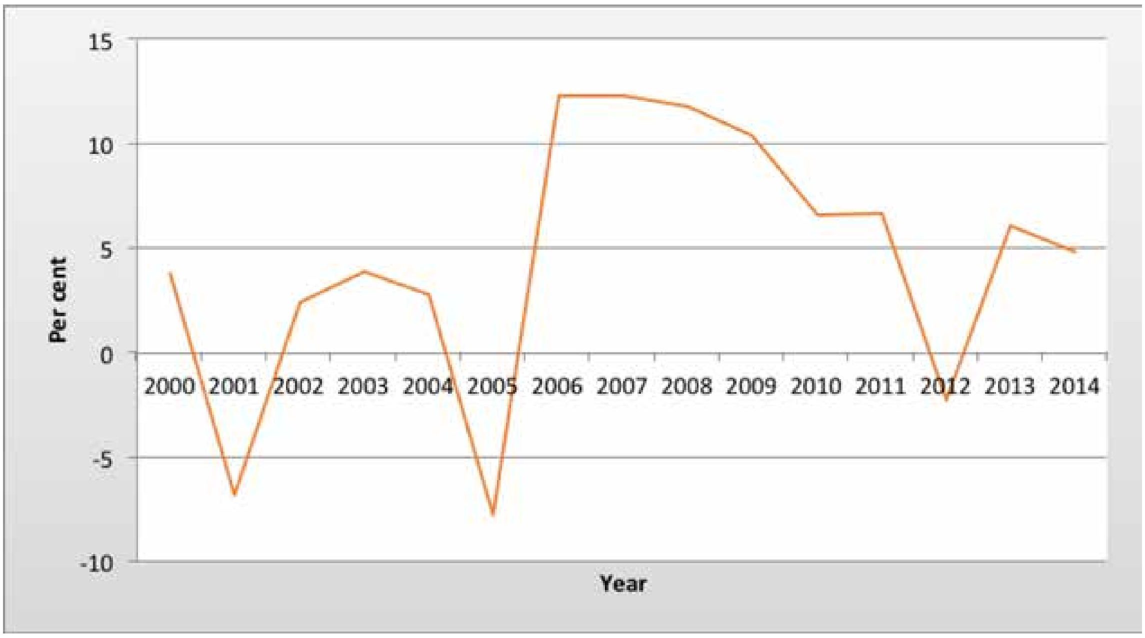
The collapse of the smallholder farmer credit scheme combined with the removal of fertiliser and hybrid maize seed subsidies, against the backdrop of a sharply devalued currency in the era of liberalisation, made farm inputs virtually unavailable to the majority of the chronically impoverished farmers. It is against this backdrop that the FISP's main objective aims to raise incomes and household food security of up to 2 million out of 3 million smallholder farmers, through improvements in their agricultural productivity. The programme targets smallholder farmers who have land but cannot afford to purchase inputs, principally maize seed and fertiliser, at market prices. The FISP is thus widely identified as the main strategy for revitalising the performance of the agricultural sector and reducing poverty.

Except for the post FISP period, the performance of the agricultural sector has been generally described as disappointing. Both estate and smallholder sub-sectors have been consistently characterised by low yields, low rate of return to capital, low rates of labour remuneration and a heavy dependence on one crop (Kachule, 2011; Chinsinga, 2012). The challenges facing the agricultural sector are attributed to low productivity, erratic weather patterns and conditions, landholding sizes and fragmentation, limited markets and value addition opportunities, weak policy performance and a decline in public sector investment in agricultural sector.

According to Chirwa, et al., (2008), extensive reforms undertaken in the agricultural sector, especially since liberalisation, have not been very effective in changing the structure and performance of the agricultural sector. The decline in public sector investment in the agricultural sector was further worsened by increasingly erratic weather patterns (Mwase, et al., 2013). Changing rainfall patterns was one of the highest ranking challenges facing farming households in our survey. Until the introduction of FISP, investment in the agricultural sector was substantially less than 10% of the annual budget. The limited funding to the sector led to substantial erosion of the core services to smallholder farmers, such as extension and research. The consequence of all this was that Malawi shifted from being nationally self-sufficient in maize in non-drought years, to being dependent on food aid and commercial food imports, mainly at the turn of the 1990s. The capacity of the country to feed itself was further decimated by, inter alia, regular bouts of flash floods, droughts, removal of fertiliser and hybrid maize seed subsidies in the mid-1990s, and sharp devaluation of the local currency that made inputs virtually unaffordable to the majority of chronically impoverished farmers.

However, as noted earlier, the introduction of FISP in the 2005/06 growing season has greatly transformed the agricultural sector. Records show that the country has consistently produced surplus maize averaging around 500,000 metric tonnes over and above the annual national food requirements. However, this is not equitably distributed, and many households in our survey reported having to sell maize and groundnuts especially, even though their own households did not have sufficient food. Mwase, et al., (2013) points out that agricultural growth accelerated from 4% in 2004/05 to 14% in 2006/07 and to around 13% in 2008/09. The agricultural growth rate has remained substantially high since the introduction of FISP which, inter alia, contributed to inflation dropping from 22%

Figure 2: Growth trends of the agricultural sector, 2000-2014



Source: Computed from various sources of NSO and RBM data in 2006 to 7.6% in 2009/10. Figure 2 shows the growth trends in the agricultural sector for the past decade. The dramatic slump in agricultural growth in the 2011/2012 growing season could be attributed to the adverse effects of a severe drought, experienced for the first time since the introduction of FISP in the 2005/06 growing season. But apart from a once-off growth boost in 2005, growth has declined constantly since the inception of the programme. In other words, GR inputs could not sustain such high growth levels.

Reviews of FISP generally have been mixed. While FISP has been accredited, generally, with increased production of maize since it was introduced in the 2005/06 growing season, there are growing concerns about the extent to which the massive investment in FISP, consistently claiming over 10% of the national budget, generates value for money (Dorward and Chirwa, 2011). For instance, some people argue that the success of FISP, especially in the initial years, cannot be attributed to the incremental impact of farmers' use of improved seed and fertiliser, but rather as a consequence of favourable rainfall patterns in consecutive growing seasons. There are also concerns about elite capture of FISP through input procurement and distribution contracts (Holden and Tostensen, 2011). A recent World Bank, et al., (2011) review of FISP's procurement processes revealed enormous irregularities which greatly undermined the programme's overall efficiency and effectiveness.

The main concern, however, is that FISP is not transformative enough to bring about the desired structural changes in the agricultural sector. Recent data from MoAFS shows that the implementation of FISP has somewhat undermined the government's efforts to diversify the crop portfolio away from maize (Chinsinga, 2011). The data shows that there is actually a reversal of some gains in the efforts to diversify as a result of the dominance of FISP. In addition, while the share of agricultural budget has dramatically improved following the introduction of FISP, the bulk of it, estimated at between 70–80%, is taken up by FISP at the expense of equally important activities such as extension and research which are key to bringing about transformative change in the agricultural sector. Olivier de Schutter (2013), the recent UN Special Rapporteur on the Right to Food, suggested the money could otherwise be spent on agricultural research, extension services, training, rural roads and infrastructure.

Evaluations have been conducted which have advocated for the redesign of FISP but such proposals have not been fully implemented. Some of these proposals include: the involvement of the private sector in the distribution of fertiliser which currently is done entirely by two state parastatals, the Agricultural Development and Marketing Corporation (ADMARC) and the Smallholder Farmer Fertiliser Revolving Fund of Malawi (SFFRFM); development of a medium-term strategy for FISP demonstrating steps toward eventual exit; minimising the level of subsidy to the farmers which currently stands at around 96% of the cost of the fertiliser; and changing the targeting criteria to focus on productive but resource constrained poor farmers rather than vulnerable groups, such as the elderly, the chronically sick, orphans and female-headed households. Lack of implementation can, inter alia, be attributed to the fact that maize is a very important political crop in Malawi, described by some scholars as 'life' (Smale, 1995). The underlying argument is that maize plays a critical role in defining the legitimacy of the state in Malawi. Sahely, et al., (2005) observed that the legitimacy of politicians in Malawi is closely linked to the availability and accessibility of maize to people at the grassroots level at prices they can afford, either through their own production or buying from the market. The fact that FISP has consistently delivered in terms of food security makes it difficult for politicians to consider making dramatic changes. Politicians are not sure whether the changes that would be made would deliver on food security and so project them as caring and loving people. There is, so to speak, a political-economic bind regarding the subsidy programme, since the question of food security is firmly at the centre of the country's electoral politics. There is thus popular consensus about the centrality of subsidies in combatting the problem of pervasive and chronic hunger.

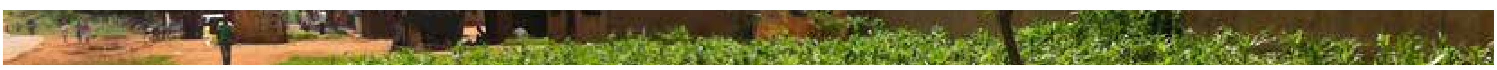
Overview of three production systems

In Malawi most rural smallholder farmers have two separate cultivation areas and farm according to the seasons. During the rainy season, which occurs through the months of November to April, farmers practice rain-fed upland agriculture with their staple crops (i.e. maize, sweet potatoes, and groundnuts). During the dry season they rely on low-lying riparian corridors (dimba land) for vegetable production (i.e. mustard greens, Chinese cabbage, onions, and tomatoes). These plots are small and scattered at varying distances from the farmers' households. Conventional agriculture, conservation agriculture (CA), and agro-ecological practices are all methods implemented in varying degrees across Malawi.

Conventional agriculture is the most common practice with smallholder farmers. It involves a continuous process of clearing and tilling the soil into ridges with a hoe, burning crop residues, planting, applying synthetic fertilisers and, if accessible, the application of herbicides, pesticides, and fungicides. Weeds, other plants, and residues from the previous year's crops are removed and burned, often leaving the soil exposed for many months, drying the soils and creating inhospitable environments for micro-organisms in which to thrive. Fertilisers are used to add nitrogen (N), phosphorus (P) and potassium (K) to the soils and foster growth from degraded soils. This continuous process of clearing, tilling, planting, and applying fertiliser creates a cycle of dependence on fertilisers. The drying of the soils and the resulting loss of micro-organisms creates a hardpan (a dense layer of soil immediately below the layer of topsoil) and prevents rain or moisture from filtering deep into the substrata to replenish the underground water tables. Large mono-cropped plots of land require more herbicides, pesticides, and fungicide use because of the susceptibility to disease.

Conventional practices over time deplete the natural resources of an area by degrading the soils, contributing to the erosion and removal of topsoil, decreasing water quantity and quality in the streams and underground reservoirs, and decreasing habitat for wildlife. External pressures like climate change exacerbate these environmental conditions with erratic weather patterns increasing farmers' susceptibility to floods and droughts. In addition, fluctuating and limited access to markets for smallholder farmers decrease income and economic sustainability. All of these factors contribute to a serious need for alternate agricultural methods that are context specific and assist farmers to be able to restore their lands and mitigate and adapt to changing climatic conditions and fluctuating markets (de Schutter, 2010).

Conservation Agriculture has been practiced in Malawi since the 1990s, with the purpose of conserving soils and decreasing dependence on fertilisers, and is defined by three interlinked guiding principles: continuous minimum mechanical soil disturbance, permanent organic soil cover, and diversified crop rotations in the case of annual crops, or plant associations in the case of perennial crops (UNEP, 2014). Ideally, the three practices—minimum soil disturbance, permanent ground cover and crop rotation—are implemented simultaneously and over a long period of time. Minimum soil disturbance is practiced in order to keep the soil intact. Mycorrhizal fungi, soil aggregates, and root systems present in the soil build organic layers and provide nutrients to micro-organisms that help with water infiltration and the uptake of nutrients to the plant from the roots. NASFAM promotes basin planting as part of minimum soil disturbance. Keeping the soils covered prevents soils from drying out and baking in the sun, which could potentially kill the natural soil organisms. Ground cover also breaks down and builds the organic and nutrient content of the soils. NASFAM promotes the use of crop residues as a key method for maintaining ground cover, and also encourages the use of animal manure to increase soil organic content. Diversifying crop rotations prevents the spread of disease in the soil and encourages an environment in which there is an uptake of nutrients for the next crop. NASFAM emphasises maize/legume intercrops and the use of fertiliser trees for nitrogen fixing. The main benefits of CA are moisture conservation, soil fertility improvement and reduction in diseases. Farmers participating in our FGDs confirmed these benefits and indicated their intention to continue and to expand CA practices next season. Although in the first year there were



not enough residues, farmers were confident this would improve as biomass production increased on the basis of these practices.

Agro-ecology has many names and varieties, and we intend for it to be a catch-all for many different systems including polyculture, permaculture, ecological organic agriculture and holistic land management. It aims to apply context-specific interventions and practices, incorporating not only the historical and cultural aspects of an area but also practices that improve diversity, reduce the need for external inputs, and improve the overall health of the ecosystem (Scherr, et al., 2013). Agro-ecology is knowledge intensive, context specific, and focuses on improving production while simultaneously improving the environment, and requires flexibility and space for experimentation. This approach includes core CA practices in addition to leveraging symbiotic relationships that exist between certain plants, insects, and animals. The focus is on improving crop diversity that naturally provides the nutrients and habitat for microbial life in the soils. For example, crop diversification with legumes fixes nitrogen, provides a disease break from staple crops, and offers security against seasonal failures by providing another source of income or food (Holmgren, 2002). In addition, different crops have varying root depths, increasing the ability of the soils to retain moisture (Ohlson, 2014). There is also the positive contribution to absorbing carbon from

Table 1: Agriculture methods and environmental effects

Type of practice	Practices	Environmental effects
Conventional agriculture	Clearing Burning Tilling Fertilisers Herbicides Pesticides Fungicides Large-scale	• Removes residues, nutrients, and soil aggregates. • Dessication of soils. • Breaks up mycorrhizal fungi networks. • Depends on expensive chemical and synthetic fertilisers. • Chemical inputs decimate beneficial and symbiotic relationships between plants, insects, and fungi.
Conservation Agriculture	No-till or minimum tillage Mulching Crop rotations Large-scale	• Improves the structure of the soils by safeguarding root masses, and micro-organism habitats. • Protects the soils, retains moisture, and through decomposition increases soil mass. • Decreases spread of disease. Crops selected that add nutrients and minerals in the soil that are absorbed by the subsequent crop.
Agro-ecology	No-till planting Cover crop cocktails Controlled livestock grazing Livestock-crop integration Intercropping Stacking enterprises Building soil health Natural pest management Organic compost Small-scale	• Same as above. • 3–20 different cover crops mixed increase the diversity of micro-organisms and nutrients in the soil. • Naturally fertilises the soil with manure and urine, decreases weeds, and breaks compaction of soils. • Decreases spread of disease. Crops selected that add nutrients and minerals in the soil that are absorbed by the neighbouring crop. • Increases income by managing healthy livestock, vegetable and crop production. • Increases productivity with less expensive inputs. • Decreases the need for herbicides, pesticides, and fungicides. • Decreases the dependency on expensive chemical fertilisers.

the atmosphere, and hence slowing human-induced global warming and climate change. Photosynthesis accounts for 98% of the movement of carbon out of the atmosphere and its storage in the soil (University of New Hampshire, n.d.). Soil is like a sponge for carbon because human activities have depleted an estimated 50–80% of soil carbon stores since the start of the industrial era (Schwartz, 2013:12). Smallholder subsistence-oriented farmers cannot afford to sacrifice crop yields in the short term for greater yields in the long term. This is a major impediment to Malawian smallholder farmers wanting to practice agro-ecology. It is possible for CA to act as an entry point for communities interested in moving away from conventional agricultural systems, and this can be coupled with a long-term vision towards agro-ecological methods.

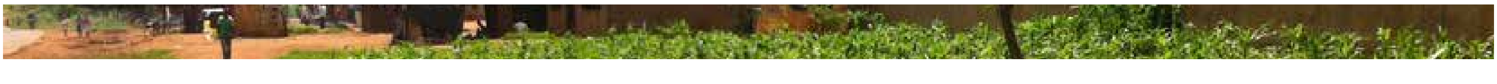
These three approaches and their practices are defined below in Table 1, along with the environmental effects associated with each.

Conservation agriculture and agro-ecological systems are alternative agricultural methods with the ability to improve yields for farmers, decrease input costs, and improve environmental conditions. CA is an important accessible entry point for farmers to begin practicing methods that do not degrade the environment. However, it does not move beyond the three practices and they are not always implemented as intended, as a suite. The core of CA aligns with agro-ecological practices but it is also open to use with GR technologies, especially hybrid seed and the application of synthetic fertiliser. Our survey finds high levels of mixing of these practices. Although not part of the core definition of CA, NASFAM and MoAFS promote the use of herbicides where weed infestation is high. Of particular concern is the introduction of glyphosate, which is used in combination with herbicide-tolerant GM maize, soya and cotton seed. However, farmers participating in an FGD in Chamama indicated they do not use herbicides because they do not have resources with which to buy them. Farmers indicated that a benefit of no till and ground cover is that these practices do not require money.

AGRA, seed and soil fertility in Malawi

AGRA has four main programmes and two additional cross-cutting areas of work. The four programmes are the Programme for Africa's Seed Systems (PASS), the Soil Health Programme (SHP), the Market Access Programme and the Policy and Advocacy Programme. The two cross-cutting areas are gender and agriculture, and the Farmer Organisation Support Centre (FOSCA). Our study focuses on seed and soil fertility and we therefore look specifically at PASS and SHP. AGRA has offered grants in Malawi from these two programmes since 2007 (see Appendix 1), but does not appear to have offered any new grants since 2012. AGRA works in what it calls the 'breadbasket districts' as the unit of analysis. These districts are Nkhata Bay, Rumphi and Mzimba (Northern Region), Kasungu, Mchinji, Lilongwe West, Dedza and Ntcheu (Central Region) and Machinga, Blantyre and Zomba (Southern Region). As indicated, our research includes two sites in Kasungu district.

PASS is divided into four sections. Seed Production for Africa (SEPA) is mainly to support production and dissemination of improved (i.e. certified) seed. In Malawi AGRA provided grants to four small private seed companies, to the Association of Smallholder Seed Multiplication Action Groups (ASSMAG) which is a smallholder farmer-managed seed production network, and to MoAFS, with individual grants valued at between US$ 137,000 and US$ 163,000 each. Crops included in SEPA were maize, beans, soya, peas, groundnuts, cassava and sweet potatoes. The Fund for the Improvement and Adoption of African Crops (FIAAC) focuses on variety development, and all grants went to MoAFS, with a total value of US$ 1,24m. Crops selected for variety development were maize, cassava, beans, sweet potatoes and rice, focusing mainly on pest and disease resistance, but also storability and the beta-carotene content in cassava. Education for African Crop Improvement (EACI) focuses on building scientific capacity at university level, with grants valued at US$ 724,000 to Bunda College at the University of Malawi, for MSc bursaries in plant breeding, agronomy and seed production.



ICRISAT is not directly involved in AGRA projects, although there is a common agenda in developing improved seed varieties. ICRISAT works with STAM to provide some foundation seed. The relationship between STAM and AGRA is an indirect association. Companies tendering for FISP contracts must be members of STAM, and some seed being developed using AGRA funds may find its way into the programme. For example, ASSMAG as an association is a member of STAM. However, at this stage, the seed generally is produced by the larger companies operating in Malawi (Monsanto, Seed Co, Demeter, Pannar). NASFAM has not received any direct support from AGRA via PASS.

The fourth programme in PASS is the Agro-dealer Development Programme (ADP). By far the largest investment by AGRA in Malawi was the three-year Malawi Agro-dealer Strengthening Programme (MASP) from 2007–2010 run by US-based CNFA (formerly the Citizens' Network for Foreign Affairs but now known just as CNFA) which worked with its local affiliate, the Rural Market Development Trust (Rumark). CNFA received a grant of US$ 4.28m and Rumark received an additional US$ 350,000 to assist in establishing an agro-dealer network across the country. According to the CNFA website, the programme started with 160 active agro-dealers in 2007 and, in the course of MASP, over 1,500 agro-dealers were certified in business management, 850 demonstration plots were established, and the programme reached over 5.7m Malawians (CNFA, 2014). We encountered CNFA-supported agro-dealers in our research sites in Kasungu, but it is clear that agro-dealers set up or supported as part of this programme are small in comparison with the established, corporate agro-dealers, such as Farmers' World (the distribution network for Demeter Seed), Kulima Gold or Export Trading Group (ETG). The CNFA-supported agro-dealers face the same challenges any small business confronts in competition with large corporations.

In 2013 a three-year, US$ 47m Scaling Seeds and Technologies Partnership (SSTP) was launched, with AGRA as the co-ordinator. The partnership operates in Ethiopia, Ghana, Senegal, Malawi, Tanzania and Mozambique, under the rubric of the G8's NAFSN. It aims to

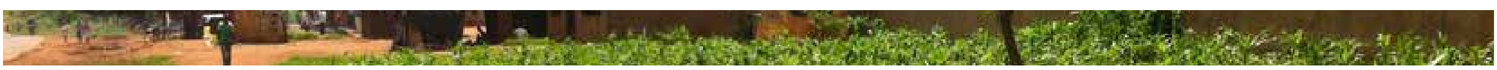
increase the production of high quality seed and help farmers to gain access to seeds and complementary agricultural technologies (FtF, 2013). SSTP works together with the African Agricultural Technology Platform and the ICT Extension Challenge Fund, all part of NAFSN. SSTP's focus is on "strengthening seed sector regulatory systems and on creating new local seed companies" (FtF, 2013:2). As with the agro-dealer work and the other PASS activities, SSTP's impact on specific farmers will be diffuse, but it contributes to the advancement of the GR agenda which may have a decisive impact on choices available to farmers over time. SSTP had not yet started practical work at the time of our research in Malawi. We will follow up on SSTP in Malawi in 2015, as well as investigate the partnership in Tanzania and Mozambique in 2015, as part of our research.

PASS received far more funding than the SHP in Malawi, indicating a focus on seed by AGRA here. Only four grants were made on soil health in Malawi: US$ 425,000 to MoAFS to expand public sector capacity on fertiliser, and US$ 366,000 to universities on ISFM/CA. NASFAM and the Clinton Foundation both received grants on practical work around ISFM. AGRA sponsored NASFAM for a three-year project (2010–2012) to integrate pigeon peas into maize production systems. The sponsorship was worth US$ 950,400 and was the largest grant to an organisation in Malawi apart from the CNFA-managed MASP. Pigeon peas are one of the lesser supported legumes in commercial research. The activities can be integrated into CA processes, especially through legume-maize rotations or inter-cropping to capture nitrogen in the soil. We did see some involvement in the pigeon peas programme in the Kasungu research sites, where it is contributing to seed saving efforts and the use of legumes as nitrogen fixers. We would like to explore further the role of these varieties of pigeon peas in the local environment, finding out where they came from, what local varieties there are, the history of their use etc. As part of follow-up work in 2015, we will focus on the AGRA-sponsored NASFAM pigeon peas programme.

As indicated above, AGRA has adopted ISFM as its core approach to soil health. This involves the application of water and nutrients as efficiently as possible to the roots of plants, maximising soil organic matter and mulching, and minimising soil disruption. In the latter, SHP promotes a no-till or conservation farming approach. Organic matter is left on the surface rather than ploughing and then discing the soil. (Discing is a process which breaks up the turned soil and sods which result from plowing.) However it is combined with significant use of synthetic fertilisers. AGRA proposes that cover crops, legumes and manure are part of improving fertility. Improved fallows are also important, entailing the planting of fast-growing legume trees to fix nitrogen and provide water and soil retention. However these practices are not sponsored by AGRA because of the lengthy time required for results and the need for additional fertiliser inputs. According to AGRA "purely organic approaches to African soil fertility are not sufficient ... and are not appropriate for poor farmers" (AGRA, 2007:8). Such approaches require too much land and labour and farmers thus do not adopt them fully (Alley and Vanlauwe, 2009:27). AGRA argues that "most 'low input' methods are also characterised as 'low-output' systems", which result in low quantity and quality of nutrient provision, producing poor outputs. AGRA proposes increasing the use of synthetic fertilisers in association with hybrid seed which have greater yield potential built into the seed. Alley and Vanlauwe (2009:25) indicate that integrated plant nutrient management (based on a combination of organic and synthetic fertiliser sources) is combined with improved germplasm to fully realise ISFM. Rather than broadcasting fertiliser, the approach aims at "targeting of fertiliser in space and time" (Alley and Vanlauwe, 2009:25).

It is clear from this brief overview (to which more detail is provided in ACB, 2012) that ISFM is very closely related to CA, but that AGRA emphasises the synthetic fertiliser angle and explicitly incorporates this into the definition. CA in combination with synthetic fertiliser was very widespread in our research sites, and as indicated in the findings below, the results are not unconditionally favourable for farmers. In particular, we found high levels of dependency on GR inputs with farmers caught in a cycle of requiring more inputs to sustain yields over time. There is a strong institutional overlap between CA and ISFM in Malawi. The Malawi Soil Health Consortium (MSHC) was launched in 2010; it focused on ISFM but lacked funding and did not do much practical work. The consortium was relaunched in May 2013 with sponsorship from AGRA. The MoAFS Farm Income Diversification Programme has activities on ISFM, and MoAFS also works together with FOs and CSOs in the Conservation Agriculture Consortium.

The research aimed to look at the impacts of AGRA projects on the livelihoods of farmers and on the ecology. As indicated above, there were two AGRA projects in our sites, the CNFA-managed MASP as part of PASS, and the NASFAM pigeon peas integration as part of SHP. From the point of view of these two projects, it is clear that AGRA's impact is diffuse at the local level. The projects have had a relatively small impact on farmers in our sites although they are part of a broader GR thrust that does have significant impact. AGRA's impact is related to the integration of improved seed into systems based on ISFM methods. This is a well thought-out strategy that advances GR technologies starting from the basis of existing production systems. So when we look at the impact of improved/certified seed, synthetic fertiliser use and the use of ISFM/CA techniques on farmers' lives and the ecology, AGRA has contributed to this but its contribution is integrated into a much bigger thrust. It is clear from the research that its impact is mostly at the broader level of facilitating and building the knowledge base for the wider GR push. Our research design was experimental and led us into a comparison



of different production practices. We did not pursue investigations of specific AGRA projects in too much detail. As part of follow-up work in 2015 we will focus in more detail on projects with the most relevance to our study, including the the pigeon peas project and its relationships with ICRISAT and public sector breeding in general, and the SSTP. Nevertheless, we have attempted to draw out AGRA's impacts in the specific sites, where possible, in this current report.

FARMER PERCEPTIONS OF AGRICULTURAL CHALLENGES

The challenges facing the agricultural sector in Malawi have been widely documented. For example, Chirwa, et al., (2008) asserted that the country's agricultural performance is characterised by low and stagnant yields, overdependence on rain-fed farming which increases vulnerability to weather related shocks, low level of irrigation and low uptake of productivity enhancing farm inputs.

While some unique factors have been highlighted by farmers as challenges that have affected the performance of the agricultural sector over the past five years, most of the factors are essentially the same as consistently identified in recent studies (Chirwa and Dorward, 2013). Strikingly, regardless of the methodology used, the challenges identified by farmers were consistently the same, although there were some notable gender differences.

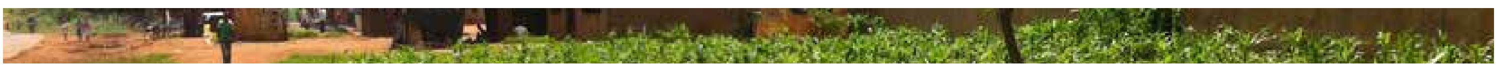
Farmers were asked to assess the extent to which particular factors were serious, moderate or not serious, as challenges to agricultural performance in their respective localities. The survey results are presented in Table 2.

The survey results show that farmers identified the high price of fertiliser (98.9%); lack of markets (81.6%); change in rainfall patterns (81.3%); and high seed price (77.3%) as the most critical constraints to agricultural performance in their respective areas. These challenges were consistently ranked the same across Chamama, Chipala and Nambuma. As noted earlier, there were some significant gender differences which are presented in Table 3.

The results show that the most critical factors for women included drought (56.8%); soil fertility (63.6%); late delivery of fertiliser (55.8%); and animal damage (40.9%); whereas men's critical concerns included pest and diseases (67.4%) and access to land (31%). There are, however, no significant gender differentials in as far as the top most critical challenges to the performance of the agricultural sector are concerned. When asked to give possible explanations for the gender differences in the challenges, women participants in Chamama laughed and said, "those men were probably drinking before they did the survey". High prices of fertiliser, lack of markets, change

Table 2: Farmers' perceptions of key challenges to farming (N=91)

Challenge	N	% Serious	% Moderate	% Not serious
Drought	90	48.9	10.0	41.1
Flood	89	22.5	10.1	67.4
Change in rainfall patterns	91	**81.3**	15.4	3.3
Soil infertility	90	53.3	28.9	17.8
High fertiliser price	90	**98.9**	0	1.1
Late fertiliser delivery	87	50.6	20.7	28.7
High seed price	88	**77.3**	15.9	6.8
Poor quality seed	88	21.6	38.6	39.8
Soil erosion	87	48.3	21.8	29.9
Lack of markets	87	**81.6**	13.8	4.6
Pests and diseases	87	56.3	31.0	12.6
Animal damage	85	36.5	32.9	30.6
Land access	87	25.3	16.1	58.6
Availability of labour	87	14.9	32.2	52.9



in rainfall patterns and high seed prices are critical for both men and women. The concern about the high prices of fertiliser and seed relate broadly to the high costs production inputs, including basic farm implements, pesticides and herbicides.

The top four critical challenges to the agricultural sector require further discussion with particular emphasis on how exactly they are experienced in practice. Both semi-structured interviews and FGDs demonstrated that these factors are intricately related and tend to reinforce each other, which ultimately makes farming for most households extremely challenging. Although there was general consensus that farming had become a challenging enterprise in these areas over the past five years, there were nonetheless a few farmers who felt that some progress had been achieved. These farmers said that in their areas a good number of farmers had managed to improve their livelihoods using money they have made from farming. This is borne out to some extent in the survey results, which indicate that some households were selling relatively large surpluses of some crops, especially maize and tobacco. These farmers in general have managed to build houses using corrugated iron sheets, and to purchase their own transport (cars, motor cycles, oxcarts and bicycles). These farmers have been able to benefit from farming because they have strictly adhered to modern methods of farming. The majority of these farmers were often retired officers who had worked either for government or in the private sector. Most of them did not have independent sources of income apart from farming. However, they have an edge over other farmers because they tend to be more enlightened and hence are able to follow better farming methods and seize better marketing opportunities, including effective bargaining with buyers of their farm produce. A few indicated that they boost their farming ventures with support (remittances) from their sons and daughters who are working in town. However, as the rest of this section shows, there are more challenges than successes as far as farming is concerned, in these areas over the last five years. Fertiliser, seed and market access issues are dealt with in more detail in separate sections of this report.

Erratic rainfall patterns

According to nearly all the farmers interviewed, increasingly erratic patterns of rainfall have contributed greatly to making farming a challenging undertaking. The main concern was that rainfall patterns are no longer

Table 3: Gender differences in the perceptions of challenges to farming (N=91)

Challenge	N	Women % serious	Men % serious
Drought	90	56.8	41.3
Flood	89	23.3	21.7
Change in rainfall patterns	91	77.8	84.8
Soil infertility	90	63.6	43.5
High fertiliser price	90	100	97.8
Late fertiliser delivery	87	55.8	45.5
High seed price	88	75	79.5
Poor quality seed	88	20.5	22.7
Soil erosion	87	50	46.5
Lack of markets	87	81.8	81.4
Pests and diseases	87	45.5	67.4
Animal damage	85	40.9	31.7
Land access	87	20	31
Availability of labour	87	15.6	13.3

predictable compared with the 1990s. The rains do come, but either too early or too late, and are either too much or too little. The main implication of erratic patterns of rainfall is that it has made "planning for farming activities extremely difficult because the onset of the rains is no longer predictable".

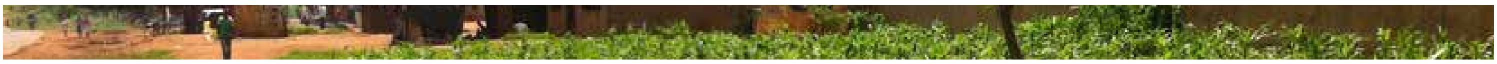
Aside from forecasting, erratic rainfall patterns have created several other challenges for farmers. Some farmers argued that it has made farming quite demanding: if the rains come early, it becomes imperative for farmers to plant all the major crops at the same time, because if they don't they will be gambling with their own survival. Most farmers reminisced that when the rains were predictable, they could systematically plan the cultivation of their crops. In one of the FGDs participants observed that "we could plant sweet potatoes as late as January because we knew that the rains could last up to April". Erratic rainfall has also placed an extra burden on farmers in relation to seed. The question of resources with which to buy seed at short notice becomes more pressing. Also, in the rush to plant with the first rains, farmers often have to replant if the rains were insufficient to ensure satisfactory germination. Replanting is almost guaranteed if there is a long dry spell immediately after the initial rains.

Erratic rainfall patterns have further contributed to a great deal of yield variability. This is attributed to several factors, including the fact that changed rainfall patterns have greatly affected the growth patterns of crops. The yields are substantially affected especially when the rains disappear during critical periods, for example, immediately after fertiliser application or during cob formation and development. So even when farmers work hard, they are challenged by "simply not getting enough rains for successful agriculture". Some farmers argued that even some of the recommended adaptation strategies to erratic rainfall patterns are not delivering expected dividends. For instance, they observed that switching to early maturing maize varieties, which take between 85 and 90 days to ripen, is not a foolproof solution because there are some years "when we just get rains for only 60 days; by February the rainy season would have ended". Other methods of retaining moisture in the soil related to CA practices are widespread, including mulching and leaving crop residues on the field, and minimum soil disturbance. At Chipala, some FGD participants observed that the erratic, short and unpredictable rainfall patterns have greatly affected groundnut production, since groundnuts do not fully develop when there is a serious shortage of rain. As a strategy for adapting to the erratic rainfall patterns, farmers indicated that "we have resorted to selling unshelled groundnuts because it helps to cut down on losses".

Weak institutional support services

Farmers also attributed the apparent decline of the agricultural sector to weak institutional support services with particular emphasis on extension and research. These weaknesses are widely recognised (Kachule, 2011; Chinsinga, 2012). For instance, Chirwa, et al., (2008) indicated that only 13% of farmers reported having accessed extension services. None of the farmers we spoke to recalled having had a soil test performed on their land.

In both semi-structured interviews and FGDs farmers indicated that extension services in their respective areas were almost non-existent. In one of the FGDs, farmers argued that "there is no way in which we can expect agriculture to thrive when government extension workers are not playing their part to enable farmers to improve on their farming practices". Farmers contended that the situation would have been even worse if some non-governmental organisations (NGOs) had



not stepped in to at least partially fill the gap left by inadequate government-led extension services. The main reservation among farmers is that the alternative extension services have limited coverage. They are not inclusive because they tend to focus on people who are affiliated in one way or another to specific service providers.

Granted that extension services are directed exclusively to those farmers with links to the providers, the main concern of most farmers is that the extension workers hardly work with them on their farms. This concern was raised particularly by farmers who belong to tobacco farming clubs. The farmers said these workers functioned only nominally as extension officers and predominantly as loan officers. Most farmers argued that these extension officers are especially concerned about the ability of farmers to get and/or repay loans. While the extension workers seldom visit farmers' fields, "they are frequent visitors to our homes once we have harvested the tobacco".

Some farmers further queried the role of research in helping to improve agriculture in the country. The farmers raised this particular concern in relation to the dramatic decline in soil fertility and the ever-rising prices of fertiliser. The farmers wondered why the country's agricultural scientists have not identified effective ways and means to help address the question of depleted soil fertility, as well as an alternative to imported synthetic fertiliser. An alternate fertiliser should be fairly accessible to the majority of poor farmers, so that they can produce enough to enable them to break free, permanently, from the cycle of poverty and deprivation. There were high levels of interest in visiting practical examples of production systems free of synthetic fertiliser.

NUTRITION AND FOOD SECURITY

Part of the research is to understand how different production methods might impact on households in a range of ways, including basic indicators such as household nutrition. We asked a set of questions in the survey related to the range of foods eaten, the source of these foods and the extent to which respondents felt their household was meeting their basic food needs.

Respondents were asked how often their current household income covers basic needs, with the option of often, sometimes, rarely or never, as possible answers (Figure 3). For Nambuma and Chamama, the majority indicated their income was rarely or never enough to cover basic needs (88.7% and 81.6% of respondents respectively), while in Chipala the majority (76.9%) indicated current income was often enough to cover basic needs. This demonstrates that households in Chipala households are better resourced than those in the other two sites. Overall the sample is fairly evenly distributed, though numbers increase slightly at the lower income end of the scale.

Respondents were also asked how often they have been unable to consume the foods they are used to: 69% indicated they sometimes, often or always cannot eat what they are used to; and just 15% were always able to eat what they are used to.

An early indication of a problem in the food system is flagged when we discover households who are not able to eat what they are used to, and yet are selling food. Fifty to sixty per cent of households that indicated they were often or always unable to eat what they wanted to, also sold maize, beans and groundnuts (Table 4). Average amounts sold were 180–190 kg each of maize and groundnuts, and 32 kg of beans. When asked how long this might last, farmers in Chamama said 200 kg of maize could last a household two months and 200 kg of groundnuts could last the entire year, based on an average of six people per household.

Dietary diversity

Dietary diversity refers to different food groups consumed by household members in the past 24 hours. We recorded foods consumed over the previous three days since Kusamala had already done so in its survey. Food was divided into different nutritional categories, as per the Kusamala survey. Dietary diversity is an important indicator of the quality of diets. Main food groups consumed by participating

Figure 3: How often does your current household income cover your basic needs? (N=91)

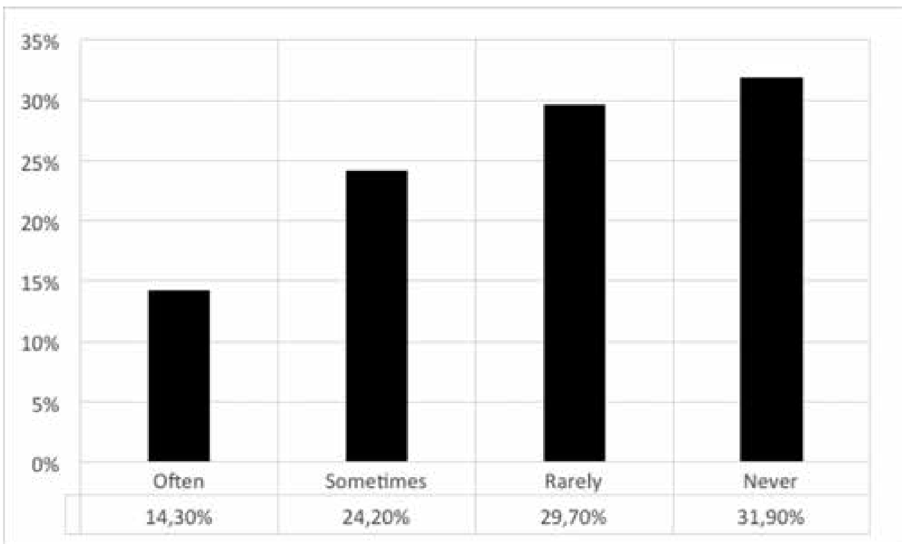


Table 4: Households selling produce even though they were often or always unable to eat what they are used to (N=87)

Crop sold	# of HH unable to eat what they are used to	% of HH unable to eat what they are used to who sold crops	Average sales (kg)
Maize	13	50	180.77
Beans	7	58.3	32
Groundnuts	9	60	187.22

Table 5: Percentage of households consuming different foods in the past three days (N=91)

%	Food group
80+	Maize; green leafy vegetables; 'other' vegetables; legumes
61–80	Oil and fats
41–60	Rice and wheat; potato group;[8] vitamin A rich vegetables and tubers;[9] mango group;[10] banana group;[11] meats; fish; sugar
20–40	Eggs; dairy; beverages and condiments

households over the past three days were dark green leafy vegetables[5] (93.4%), maize (92.3%), legumes or nuts[6] (87.9%) and 'other' vegetables[7] (87.9%). Dairy (28.6%), beverages and condiments (34.1%), and eggs (38.5%) were the least consumed items during the previous three days (Table 5).

Anything below three different food groups consumed in the past period indicates minimal dietary diversity.[12] We found that 7.7% of the sample (seven households) had eaten three or fewer of these food categories in the past three days. This is relatively low, indicating a fair degree of dietary diversity among the participating households.

Sources of food consumed

Most food consumed in the household in the past three days was produced by the household itself or was purchased. Very little food was sourced from trade, bartered, gifted or shared. Food types where own production was predominant included maize (94%), pumpkins/orange sweet potatoes (86.7%) and legumes (83.3%). Food types where own production was still the majority but not overwhelmingly so, included eggs (69.4%) and potatoes (58.8%). Foods that were predominantly purchased included oils and fats (100%), sugar (96.3%), dairy (96.2%), fish (89.7%), rice and wheat (81.1%), beverages and condiments (83.9%) and 'other' vegetables (75%). Foods where the majority was purchased but not overwhelmingly so, included greens (63.1%), meat (60.9%) and mangoes (55%). Of the major food groups consumed, maize and legumes tended to be produced by the household, while vegetables were purchased, although a substantial minority of households produced some of the latter at home.

5. Mustard greens, pumpkin greens, rape, amaranth, green beans, Chinese cabbage.
6. Beans, groundnuts, pigeon peas, soya, other nuts or seeds.
7. Tomatoes, onions, cabbages, green maize, mushrooms, okra pods.
8. White/Irish potatoes, white yams, cassava, white sweet potatoes, chips.
9. Pumpkins, orange flesh sweet potatoes.
10. Ripe mangoes, ripe papayas, tangerines.
11. Bananas, guavas, lemons, avocados.
12. "Dietary diversity among households", document sent by Stacia Nordin, FAO Malawi, Nutrition Officer.

Table 6: Percentage of households indicating source of food consumed in the past three days (only households consuming this source of food) (N=91)

%	Own production	Purchased
>80%	Maize; legumes	Rice and wheat; fish; dairy; oil and fats; sugar; beverages and condiments
50-80%	Potatoes; pumpkins/sweet potatoes; green leafy vegetables; banana group; meat; eggs	Green leafy vegetables; 'other' veg'; mangoes; banana group; meat

Some respondents answered more than one, so totals may be more than 100%

Foods that are purchased indicate a demand. This obviously includes processed products (oils and fats, sugar, dairy and beverages) but significantly also includes fruit and vegetables (Table 6). Participating farmers indicated financing for inputs (seed and fertiliser), lack of water and storage issues (especially for pumpkins, mentioned in Chamama) as obstacles preventing expansion to meet demand.

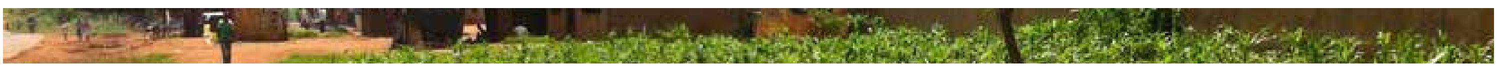
For livestock products, although dairy and fish are overwhelmingly purchased, meat is more evenly split with more than 50% of households indicating they had produced their own meat consumed in the previous three days. Although the majority of households had not consumed eggs in the previous three days, more than 50% of those who did sourced the eggs from their own production. Grazing land was not seen as a constraint in Chamama, where the main livestock-related challenges were start-up capital to purchase large stock (cattle) and diseases affecting poultry.

More than half of respondent households had consumed fruit in the past three days, split between own production and purchases. Banana and mango trees are quite widespread in the research sites—23% of respondents had banana trees and 20% had mango trees. Papayas are also significant (22%) and more than 10% of households also indicated they had guava trees. Forty-six per cent of respondents indicated having food trees, with the highest percentage in Nambuma (Table 7). Farmers in Chamama indicated an interest in expanding fruit production for local markets, with key constraints identified as lack of technical knowledge and short shelf life. There is some moringa production in Nambuma, as part of a Japanese-sponsored project which includes functioning value addition activities.

Table 7: Food trees by area

Tree type	Total (N=91)	Chamama % (N=30)	Chipala % (N=31)	Nambuma % (N=30)
Any food tree	46.2	36.7	48.4	53.3
Guava	12.1	10	16.1	10
Mango	19.8	16.7	16.1	26.7
Banana	23.1	30	22.6	16.6
Avocado	3.3	3.3	3.2	3.3
Citrus	8.8	3.3	12.9	10
Mulberry	3.3	0	0	10
Papaya	22.0	13.3	29	23.3
Moringa	5.5	0	0	16.7

On any land (main field, dimba, around home)



Some farmers pointed out that they are unable to engage in farming productively because they are caught in a web of chronic food insecurity. These farmers are trapped in a vicious cycle of poverty and deprivation which becomes almost impossible to break. This is inevitable because most families in rural Malawi run out of food well before the next harvest, which forces them to start working for cash in order to survive. Only six households indicated they did not run out of farm-produced food before the next harvest. All of these came from Chipala, reinforcing the evidence that the Chipala sample is relatively better-off than the other two sites. Of these, all of them relied on own production for household maize consumption, 71% produced their own beans, greens were evenly split between own production and purchases, and the majority relied on purchases for 'other' vegetables.

The main concern is that the majority of households run out of food during the critical farming period. The survey results show that 56% of households run out of food between October and February which are critical months in the farming calendar in Malawi. For the affected households it becomes almost impossible to work on their own gardens. Thus they neglect their own gardens to earn a livelihood by working on other people's gardens, either for cash or food. Then, by the time they can begin to work on their own gardens again, it is often too late to harvest enough for subsistence—hence they are trapped in a vicious cycle of poverty and deprivation.

To keep the baseline simple we selected only two proxy measures for household food security as reported above: dietary diversity and whether households could eat foods they are generally used to. There are many other issues that need to be considered to get a full picture of household food security, but ACB does not have the resources or expertise to conduct a full food security and nutrition study at this stage. Key additional questions include the quantity of food consumed by individuals, and the capacity of household members to absorb the nutrients (see Diskin, 1994) on the linkages between availability, access and nutrition).

LAND ACCESS AND CULTIVATION

Although land is not a focus area for the research, it is obvious that land ownership and access is an essential variable in agricultural production. The survey shows average land holdings are just less than 7 acres (2.8 ha)[13] per household, with a variation of 4.5 acres in Nambuma and 9.85 acres in Chipala (Table 8). The larger average size of land owned in Chipala is slightly skewed by one large holding (98.8 acres). The average amount of land cultivated in Chipala is similar to Chamama at around 6.5 acres. In Nambuma, land owned and cultivated is slightly lower than in the Kasungu sites. This is one among many signs of some differentiation among producers, especially in Chipala. At the moment we are trying to establish the basic situation, and thereafter we can track the extent to which differentiation is occurring over time, see if there are any links that can be made to the GR package, and determine whether some households are starting to decline while others are starting to improve.

Cultivated land includes own land, dimba land, rented land and borrowed land. We did not gather information on collective land, including grazing. The portion of own land cultivated averaged 69.8% of total land owned by households. Just under one-third of households (29.7%) rented some land for cultivation, at an average of 2.26 acres (just under 1 ha) among those who rented. In Kasungu the average land size rented is slightly higher than in Nambuma. A small number of households were borrowing land for cultivation, at an average of 1.25 acres (0.5ha) among those who borrowed, and all borrowed land was less than 5 acres (2ha). These households are mostly in Nambuma.

Dimba land averages 0.5 acres (one-fifth of a hectare) and is unevenly distributed across the three sites. Chipala has very small plots (just 0.19 acres on average) while there are slightly larger plots in Nambuma (0.69 acres average). This is based on the amount of dimba land across all households, including those without access. The gap closes when considering the size of dimba land used by those who actually had access to and cultivated it (indicating fewer people with access to dimba land in

Table 8: Average size of land owned and cultivated in the past season (acres)

Area	Average land owned (acres) (N=91)		Average land cultivated in past season (acres) (N=90)				
		Own land (all)	Rented land (those who cultivated rented land)	Borrowed land (those who cultivated borrowed land)	*Dimba* land (all)	Dimba land (those who cultivated dimba land)	Total land cultivated
Chamama	6.33	4.78	2.90 (N=10)	0	0.58	0.82 (N=21)	6.36
Chipala	9.85	5.86	2.75 (N=4)	1 (N=1)	0.19	0.82 (N=7)	6.45
Nambuma	4.49	3.86	1.62 (N=13)	1.3 (N=5)	0.69	0.94 (N=22)	5.50
Total	**6.92**	**4.83**	**2.26 (N=27)**	**1.25 (N=6)**	**0.49**	**0.88 (N=50)**	**6.09**
Range	0-98.80	0-16.00	0.50-7.00	0.50-2.00	0-4.50	0.25-4.50	1.00-18.00

13. Taking one hectare as more or less 2.5 acres, based on NASFAM survey.

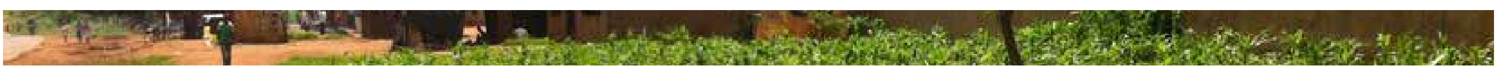
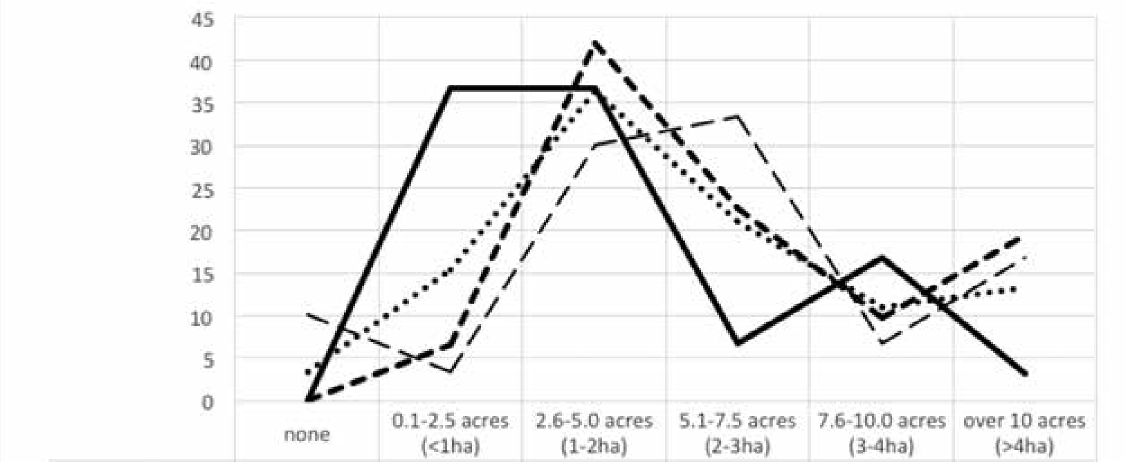


Figure 4: Land ownership, size categories by area (%) (N=91)



	none	0.1-2.5 acres (<1ha)	2.6-5.0 acres (1-2ha)	5.1-7.5 acres (2-3ha)	7.6-10.0 acres (3-4ha)	over 10 acres (>4ha)
Chamama	10	3,3	30	33,3	6,7	16,7
Chipala	0	6,5	41,9	22,6	9,7	19,4
Nambuma	0	36,7	36,7	6,7	16,7	3,3
Total	3,3	15,4	36,3	20,9	11	13,2

Chipala), and is closer to 1 acre in all three sites (Table 8). While these are very small units they are clearly crucial when we examine dimba production (see production section). Although farmers are challenged by the scattered location and diminutive size of these units there are potential markets for fresh produce for those with access to dimba land

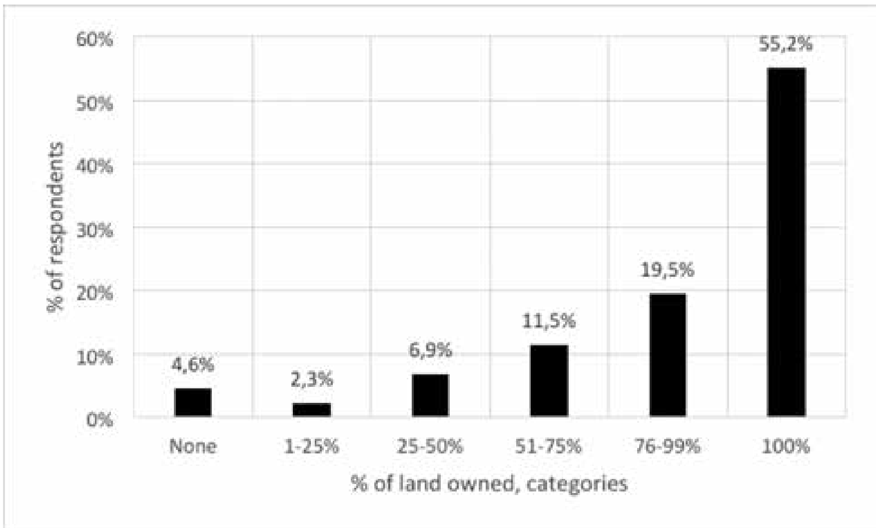
In Chipala total cultivated land is less than total owned land, though again the one large case (98.8 acres owned, 13 acres cultivated) skews this result slightly. Of the three sites, Nambuma is more reliant on rentals and borrowing, signifying potential land demand (people need more land than they have). This is a nascent expansion on the basis of short and potentially insecure tenure (rental), although we would need to look at the types and terms of rental contracts and agreements to understand the tenure issues more clearly.

Fifty-seven per cent of households reported owning between 2.6–7.5 acres (1–3 ha) across all sites. In Nambuma land size owned is slightly smaller, with 73.4% owning less than 2 ha per household (Figure 4). There are three landless households in the survey, all in Chamama. These three households all rented land for cultivation (1 acre, 3 acres and 7 acres). There are some larger land owners (owning more than 4 ha), especially in Kasungu where 15–20% of households reported owning more than 4 ha. Farmers in Chamama indicated that landlessness was a growing issue, citing the estates as a problem.

There are some significant relationships between size of land holding and key challenges facing farming households. Changes in rainfall patterns and lack of markets are serious issues across all land ownership sizes. High seed prices generally show a rising seriousness with increasing farm size, from 66.7% in the landless category to 90% in the 3–4 ha category and 82% in the >4 ha category. Poor quality seed becomes more of an issue for smaller farmers, from 21% in the <1 ha category to 9% in the >4 ha category, but this is not an even trend. Not surprisingly, land access as a serious challenge decreases with increasing land holding, from 66.7% of the landless to 10% of those owning >4 ha. There were no clear trends between land size and the other key challenges identified.

In Chamama, the three landless households were joined by another household which had not cultivated any of its own land in the past season. A total of seven households (8% of the sample) had not cultivated any of their own land in the past season, across all sites.

Figure 5: Own land cultivated as percentage of land owned, categories (N=87)



Generally the size of own land cultivated is similar across the three sites, with an average of 44% of the overall sample cultivating 1–2 ha. Nine per cent cultivated more than 4 ha with 16.7% in Chipala and 6.7% in Nambuma. The three landless households are male-headed, and all land greater than 4 ha is owned by male-headed households.

Fifty-five per cent of respondents used all their own land for cultivation in the past season, and three-quarters of all farmers cultivated more than 75% of their own land (Figure 5).

Most dimba land cultivated is smaller than 1 ha, with 44% of households not cultivating on dimba land in the past season. The percentage of those not cultivating any dimba land ranged from 77% in Chipala to 27% in Nambuma and 30% in Chamama. Only two households indicated they cultivated dimba land between 1 and 2 ha, and there were no land units any larger. Sixty-three per cent of respondents cultivated total land between 1 and 3 ha. This shows a similar trend to land ownership, with the curve peaking around 1–2 ha (Table 9).

Within the context of small units of land and the heavy reliance on access to land to meet basic food needs for the majority of the population, the GR orientation towards large scale production is a dangerous threat. The Malawi G8 Cooperation Framework commits the Malawian government to release 200,000

Table 9: Total cultivated land last season by area and size categories (N=91)

	0.1-2.5 acres (<1 ha)	2.6-5.0 acres (1–2 ha)	5.1-7.5 acres (2–3 ha)	7.6-10.0 acres (3–4 ha)	over 10 acres (>4 ha)
Chamama	2	10	10	4	4
	6.7%	33.3%	33.3%	13.3%	13.3%
Chipala	3	13	7	2	5
	10.0%	43.3%	23.3%	6.7%	16.7%
Nambuma	6	10	7	4	3
	20.0%	33.3%	23.3%	13.3%	10.0%
Total	11	33	24	10	12
	12.2%	**36.7%**	**26.7%**	11.1%	13.3%

ha of land in both customary and leasehold areas for large-scale commercial agriculture by 2015 (NAFSN, 2013:6). We must ask where this land will come from and who will be dispossessed as a result.

Land for production is within a 5 km radius of homesteads (Table 10). In Chamama, nearly 60% of respondents indicated their fields were right next to their homes. Land for cultivation is generally further away in Nambuma, with Chipala in the middle somewhere. Overall, Nambuma households have less land and the land is further away.

Table 10: Distance to own land (km) by area (N=91)

	no distance	0.1–1 km	1.1–5 km
Chamama	15	6	5
	57.7%	23.1%	19.2%
Chipala	7	11	12
	23.3%	36.7%	**40.0%**
Nambuma	1	11	16
	3.6%	39.3%	57.1%
Total	23	28	33
	27.4%	33.3%	**39.3%**

Dimba land is within 1 km for most respondents in Chamama and Nambuma, but more than 1 km away for most in Chipala (Table 11).

Table 11: Distance to dimba land (km) by area (N=91)

	No distance	0.1–1 km	1.1–5 km	>5 km
Chamama	2	11	5	1
	10.5%	**57.9%**	26.3%	5.3%
Chipala	1	1	4	0
	16.7%	16.7%	**66.7%**	0.0%
Nambuma	1	18	3	0
	4.5%	**81.8%**	13.6%	0.0%
Total	4	30	12	1
	8.5%	**63.8%**	25.5%	2.1%

PRODUCTION AND YIELDS

This section looks at the baseline data for production, yields and sales of produce on the participating farms. In the survey we asked whether farmers had produced any of a list of 34 crops in the main field, on dimba land and around the homestead.

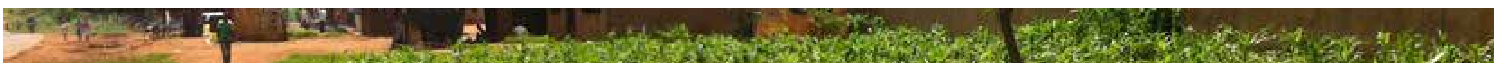
The findings indicate that maize, groundnuts, tobacco and beans are the most widely produced crops, followed by hybrid maize (as a category distinct from local maize) and soya (Table 12). AGRA's seed work emphasises maize, beans, soya, peas, groundnuts, cassava and sweet potatoes, so a mixture of commonly cultivated crops and less cultivated crops. There is some differentiation in maize production by area (Table 13). In Nambuma a high percentage of the respondents produced local maize, while in Chamama hybrid maize is predominant. Most of the main crops are fairly widespread in all the areas although pumpkins are very widespread in Nambuma but less so in the Kasungu sites. Sweet potatoes are slightly less

Table 12: Percentage of respondents producing crops in the past season (in order of significance) (N=91)

% producing	Main field	*Dimba*	Around homestead
81–100	Maize, groundnuts, tobacco, beans		
61–80	Hybrid maize, soya		
41–60	Pumpkins, local maize, sweet potatoes		
21–40	Cow peas, mangoes, blackjack, okra, tomatoes	Maize, mustard, pumpkins, tomatoes, hybrid maize	
20% or less	Pigeon peas, bananas, cassava, papayas, amaranth, Irish potatoes, mustard, rape, citrus, guavas, moringa, sugar cane, onions, roselie, mulberries, sorghum, millet, rice, Chinese cabbages, cabbages, lemon grass, avocados	Rape, beans, sugar cane, local maize, sweet potatoes, Irish potatoes, bananas, Chinese cabbages, cabbages, onions, amaranth, blackjack, cassava, okra, guavas, mangoes, tobacco, rice, papayas, carrots, lemon grass, citrus	Maize, papayas, pumpkins, tobacco, hybrid maize, local maize, sweet potatoes, mustard, mangoes, bananas, beans, groundnuts, guavas, soya, moringa, amaranth, blackjack, roselie, lemon grass, avocados, citrus, pigeon peas, cow peas, sorghum, millet, okra, rape, tomatoes

Table 13: Percentage producing main crops in main field by area

Crop	Chamama % (N=30)	Chipala % (N=31)	Nambuma % (N=30)
Hybrid maize	90	71	66.7
Local maize	30	58.1	80
Beans	83.3	71	90
Groundnuts	90	90.3	86.7
Tobacco	86.7	83.9	80
Sweet potatoes	50	38.7	56.7
Soya	73.3	70.1	80
Pumpkins	40	51.6	86.7



widespread in Chipala than in the other two sites.
Among those who planted on dimba land (53% of the sample), 60% planted mustard, 48% planted pumpkins and 46% planted tomatoes. Of those who planted around the homestead (51% of the sample), one-quarter planted papayas and one-fifth planted pumpkins.

Overall about half the sample planted on dimba land and around the homestead, although this is unevenly distributed in the three sites. In Chipala less than 30% of respondents planted on dimba land in the previous season, while in Chamama only 30% planted around the homestead (Table 14).

Table 14: No planting on dimba land or around home in past season by area (N=91)

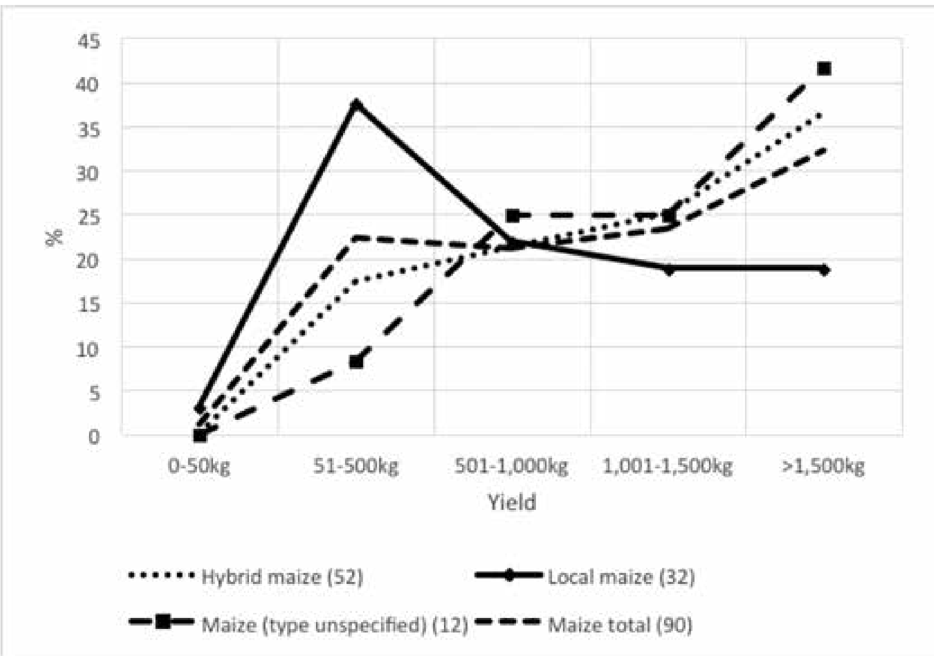
Area	No planting on dimba land %	No planting around home %
Chamama	36.7	70
Chipala	71	45.2
Nambuma	33.3	36.7
Total	47.2	50.5

There is a clear gender difference regarding planting on dimba land, with 64% of female-headed households not planting on dimba land in the past season, while 44% of male-headed households did not plant on dimba land. This indicates lower access to land for women. Even if dimba land is small, it plays a crucial role in enabling households to produce a variety of foods.

Average maize yields were 1,700 kg, with hybrid maize yielding an average 1,772 kg and local maize yielding an average of 1,253 kg. Of the respondents producing hybrid maize 61.5% had yields in excess of 1 ton, compared with 37.6% of respondents producing local maize (Figure 6). This indicates that hybrid maize tends to yield higher than local maize, and is one reason why farmers have adopted hybrid maize.

About one-fifth (21%) of tobacco producers yielded more than a ton of tobacco in the past season, with an overall average yield of 694 kg. We have treated bales as 100 kg for purposes of quantification. The remainder of the major crops produced yielded less than 1 ton on average, dropping from an average yield of 457 kg of unshelled groundnuts to an average yield of just 32.4 kg for pigeon peas. Pigeon

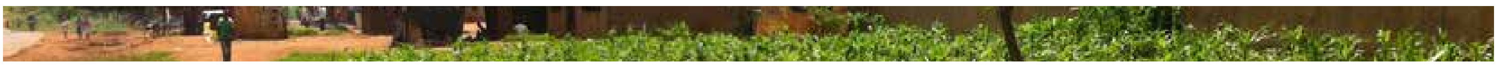
Figure 6: Maize yields by maize type (N=91)



peas, cow peas and to some extent soya can be considered still to be in an experimental phase, with farmers receiving seed on loan for bulking up, and keeping the surplus after repaying twice or three times the quantity received. Bean yields are surprisingly low, with all producers yielding 500 kg or less, and an average yield of 98 kg. Average yields of sweet potatoes were 208 kg.

We can look at crop yields by production practices, but will need to control other variables (e.g. land size) and this can get a bit tricky with a relatively small sample like ours.

Just short of 1.5 tons of maize (1,490 kg) on average was retained for home use. Because of greater yields, more hybrid maize on average was kept for home use (1,493 kg) compared with local maize (1,173 kg). Just over half the respondents retained more than 1 ton of hybrid maize, and just over one-third of producers retained more than 1 ton of local maize for home use. Around 255 kg of groundnuts (unshelled) on average were retained for home use, and other crops ranged from an average of 133 kg of sweet potatoes to 12 kg of pigeon peas. These figures include seed saving. On average 70 kg of beans and 40 kg of soya were kept for home use. The vast majority of producers of beans, groundnuts, pigeon peas, cow peas, soya and sweet potatoes kept less than 500 kg of the product for home use.



THE ROLE OF TOBACCO

An explicit aim of the research is to contribute towards better understanding of the on-the-ground dynamics of the GR push in Malawi, with an implicit focus on food crops. However in Malawi, sooner or later, any agricultural intervention is likely to come into contact with tobacco production, especially in key tobacco areas like the Kasungu and Dowa districts. Malawi is the world's most tobacco-reliant economy, with the crop accounting for more than 60% of foreign exchange earnings. Since the sector was liberalised in 1992, small-scale farmers have become the majority producers (Prowes and Moyer-Lee, 2013).

Agricultural liberalisation in Malawi led to the emergence of a number of organisations to co-ordinate tobacco production and marketing among small-scale farmers. NASFAM is one such organisation, created in 1994 with funding from USAID, with a primary focus on tobacco (Chirwa and Matita, 2012). The underlying argument is that the majority of the farmers lack access to viable credit facilities to procure productivity enhancing inputs, particularly fertiliser and seed. Farmers acknowledge efforts to support farmer organisations but also note uneven impacts, with poorer farmers accessing benefits on worse terms than better-off farmers. If, for instance, a farmer gets a bag of fertiliser valued at MK 20,000, he/she is expected to repay one 100 kg bale of tobacco. Farmers estimated the market value of this volume of tobacco at between MK 80,000 to MK 100,000. In one of the semi-structured interviews, the terms of loan repayment were described as "utterly exploitative and broad day light robbery ... which is why we say we need the MoAFS clubs back".

Regionally, tobacco control is becoming increasingly important. In Uganda, for example, an Anti-Tobacco Control Bill is under consideration, and in Kenya politicians are threatening the closure of tobacco plants and banning the use of tobacco on the basis of the 2007 Tobacco Act (Wainaina, 2014). US-based companies Limbe Leaf Tobacco (Universal Corporation) and Alliance One International operate a cartel in Malawi and exert heavy influence on Malawi's economic and trade policy (Otanez, et al., 2007). Persistent questions are raised about manipulation of exchange rates, with the kwacha appreciating when farmers are selling (transactions are in US$) and then dropping when farmers need to buy inputs. In 2014 farmer losses from exchange rate fluctuations at selling time were estimated at MK 30 billion (Chiyembekeza, 2014).

Multinational tobacco companies are using small-scale farmers as their defence, arguing that tobacco generates livelihoods for millions of farmers in the region. It is clear even from our small survey that farmers rely on tobacco, and to a lesser extent on hybrid maize seed, for cash and for access to fertiliser. But the terms of exchange are very poor for producers who find themselves tied into an exploitative contract farming relationship, in which they depend on credit for inputs in order to produce, but remain in poverty while the MNCs reap large profits. Radio reports in August 2014 indicated that farmers in Kasungu were reportedly running away from sheriffs who were unleashed to seize property from farmers who failed to repay their loans.

Though there was a general perception among the farmers interviewed that the high risks (such as debt and dependency) may outweigh the small profit margins, tobacco is seen as a guaranteed market that generates cash. Farmers were emphatic that the deal was not fair, with high interest rates deducted without consultation. When questioned in more detail, focus group members replied that it was the only way they could access fertiliser (the tobacco loan package they received includes 50 kg of urea and 50 kg of NPK fertilisers for maize cultivation—see Table 15). For most resource-poor farmers, tobacco production generates a cycle of dependency.

An example from the FGDs described how, in order to access the tobacco input package from Premium Tama tobacco, club members must each deposit MK 33,000 into the club's bank account (via their club office bearers). In order to raise this sum focus group participants spoke of having to sell animals, maize surpluses, or labour for others. One participant explained how she had planned to combine with a friend to access this, but still could not raise her share of MK 16,000.

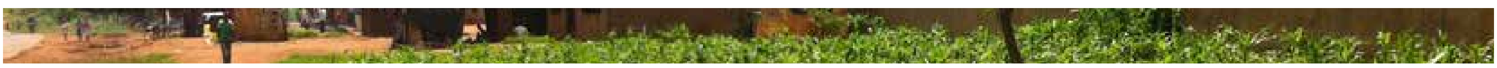
Once the required amount is deposited into the club's bank account, the inputs are delivered to the farmers in the month of November. At the beginning of the season Premium Tama sends inspectors to check on cultivation practices (such as the correct application of fertilisers). Cultivation begins in the farmers' tobacco nurseries, and plants are then transplanted to the main field. Technical support is provided by the tobacco company during the growing season but only for tobacco, not other crops.

Once the tobacco is ripe it is picked and dried by the farmer (the tobacco leaves are hung to dry from wooden frames constructed by the farmers). The farmers then grade the tobacco (according to appearance, texture etc.) and bind the tobacco into 110 kg bales, using a baling jack which must be hired for between MK 800–1,000 per bale. Farmers are expected to produce 5 bales (or 550 kg) of tobacco from the 0.5 ha for which they are given inputs. This is achievable if the rains come, but farmers carry the production risk if there is no rain.

Once it is baled, the farmer must then transport the tobacco to their local group action committee (under NASFAM), usually by oxcart, at a cost of around MK 1,000/bale. From here arrangements are made to transport the tobacco by lorry to the auction house for sale, at a cost of MK 2,900/bale. Tobacco transporters are selected by NASFAM

Table 15: Tobacco loan package (for 0.5 ha of tobacco cultivation)

Input	Quantity	Cost of repayment (MK)
Super D fertiliser	200 kg (4 x 50 kg bags)	70,000
CAN fertiliser	100 kg (2 bags)	25,200
Urea	50 kg	15,500
NPK (23:21:0)	50 kg	16,500
Tobacco seed	10 g	
Maize seed (DK8083, SC627)	10 kg	
Cofidor (pesticide – ants)	500 g	2,000
Antack (pesticide – ants)	2.5 L	5,000
Diosis (pesticide – worms)	300 g (6 x 50 g)	2,500
Acteric (pesticide – maize weevils)	200 g	980
Copper (pesticide for tobacco nursery)	—	1,800
Black tarpaulin sheet	2	6,000
White tarpaulin sheet	2	3,000
Cash (used to buy rods to hang tobacco)		33,000
Total cost		181,480



and the tobacco company; their vehicle must be roadworthy and they must have general insurance and a tarpaulin. During this phase one member of the tobacco group is selected to escort the vehicle to the auction house and remain in contact with the driver, who will inform the farmer representative of the date of sale. The tobacco club will then make arrangements to attend the auction on this date.

The producer carries all the risk until the moment of sale. Though the farmers receive a detailed invoice providing the various price elements of the transaction, invoices are difficult to read, in English and give prices in US dollars. Farmers do not have any negotiating power in the structure of costs; they are 'price takers', accepting whatever price they are offered. A breakdown of the tobacco value chain from input to sale of the dried leaf on the auction floor, based on an invoice shown in one of the focus groups, is given in Table 16.

It is clear from this that in Malawi tobacco production is operating along the classic contract farming model, where farmers with no bargaining power must take on exorbitant loans to grow cash crops yet receive a tiny fraction of its final value. The value chain needs to be investigated further, together with farmers, to determine the real benefits to them in the long run of planting tobacco. As the World Bank states, "farmers are carried away by the high gross return from tobacco instead of comparing the net returns" (World Bank, 2003:5). Although tobacco production may give farmers access to fertiliser, this in itself has negative long-term effects.

There is clear evidence of a global shift in tobacco cultivation to developing countries primarily because of lower costs which are borne by farming households and the ecology (Geist, et al. 2009). Tobacco is a highly labour intensive crop, requiring an estimated 3,000 hours/ha/year compared to 265 hours for maize (Duffy, 2013). While this may be seen as an employment provider, it also draws labour away from food production in areas where labour may be seasonally scarce. Further, tobacco is not a crop that can be kept back for consumption in times of acute hunger and there is no prospect of farmers finding alternative buyers or engaging in value addition. Deforestation and the removal of natural vegetation, especially wood for curing and drying, are well-known effects of tobacco planting. Tobacco is a heavy user of soil nutrients and thus requires heavy application

Table 16: Tobacco cost breakdown for one club, Chamama

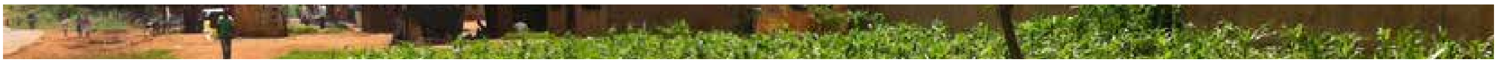
	Total (48 bales) (US$)	Per bale (US$)	Per bale (MK)
a. Proceeds from sales	8,445	175.9	73,878
b. Charges at auction floor (selling concession, TCC tax and class, ARET, NASFAM levies)	359.2	7.5	3,150
c. Deductions (NASFAM transport, hessian, tax)	909.56	18.95	7,959
d. Loan repayment	6,042.65	125.89	52,873
e. Baling jack	102.86 (MK 43,200)	2.14	900
f. Transport to action committee	114.29 (MK 48,000)	2.38	1,000
g. Profit after deductions, loan repayment etc. (but excluding labour)	916.44	19.09	8,019
h. Average per farmer[14]	114.56 (MK 31,655)	2.39	1,002
i. Farmers' share of total sale (g/a x100)	10.85%		

Source: focus group discussions and receipts
MK/US$ 420:1 exchange

14. Total figures on the auction house receipt reflected for the tobacco club, consisting of eight farmers in this case.

of fertilisers in its cultivation. According to Ag PHD's mobile app on nutrient removal, a ton of tobacco leaves draws 36 kg of N, 57 kg of K, 9 kg of P, 6 kg of sulphur (S), 8 kg of magnesium (Mg), 25 kg of calcium (Ca) and other trace elements, although obviously a lot depends on the soil. This has an enormously detrimental effect on soil health, especially if these nutrients are not adequately replaced. Tobacco requires the application of large quantities of pesticides and growth regulators, including highly poisonous organophosphates, with up to sixteen applications per season (Brown, 2003). This has impacts on soil health, creates runoff into water supplies and damages the health of those working the land. As a crop, tobacco offers no replenishment to the soil and residues cannot be used for animal feed. Residues must be cut and burned to prevent diseases before the next planting (Lecours, et al., 2012).

It is evident there are major questions about tobacco production, ranging from human and ecological health impacts to benefits for producers. Currently tobacco is a key crop allowing Malawian farmers in the areas we studied to generate cash, but it also locks these farmers into a cycle of dependency with little prospect of breaking free. Despite global recognition that tobacco production has few saving graces apart from generating a small income for farmers, production has expanded rapidly in recent years in Zambia and Mozambique in particular, and tobacco production is entrenched in the political economies of Uganda, Malawi, Kenya, Tanzania and other countries in the region. Two main challenges confront efforts to shift away from tobacco and towards more socially and ecologically sustainable crops. First, governments are heavily dependent on revenues from tobacco sales; secondly, farmers rely on tobacco as a cash crop. Movement away from tobacco will require feasible alternatives both for governments and farmers. Switching to other cash crops may be possible over time, but markets must be in place and there is a danger that other cash crops, such as cotton, will also produce ecological problems (e.g. high water and fertiliser use, a shift to GM seed and heavy herbicide use). We should engage with farmers to discuss these issues and consider possible alternatives.



SEED ACCESS AND PRACTICES

Undoubtedly a key focus of the GR thrust is to develop seed policies, laws and institutional systems that facilitate seed certification based on the distinct, uniform and stable (DUS) requirements as set out in the global Union for the Protection of New Varieties of Plants (UPOV). This is a stepping stone towards commercial seed production through the involvement of private companies. AGRA has a major focus on seed and works on building technical capacity to produce 'improved' seed in accordance with commercially acceptable quality standards, as well as in policy and legal work to create the legal and institutional conditions for the entrance of the private sector into seed production. There are numerous problems with the introduction of commercial seed systems in this way. First, they tend to ignore the critical role of farmer-managed seed systems where seed does not pass through formally regulated procedures. Secondly, they create conditions for monopoly control of varieties for private profit. The AGRA country representative referred specifically to efforts to restrict the dissemination of publicly-owned seed varieties and to licence these to single companies for commercialisation. Thirdly, DUS requirements reduce the necessary diversity for a sustainable seed system by standardising a few varieties and marginalising non-standard seed.

Government has long played a role in distributing improved seed. Despite liberalisation in the 1990s, it continued offering assistance to smallholders to access seed through the Starter Pack programme (1998–2000), the Targeted Input Programme (TIP) (2000–2005) and then FISP (Mloza-Banda, et al., 2010). Under FISP government refunds pre-registered seed companies and agro-dealers for the distribution and sale of certified seed to targeted beneficiaries. This is mainly certified hybrid and OPV maize varieties but also cotton and legumes, and is donor funded (ISSD, 2012). Government work on certified seed predates AGRA, but AGRA provides significant support for building breeding capacity at universities, increasing certified seed production through

private seed companies, constructing dissemination channels through private seed companies and agro-dealers, and facilitating production systems that integrate improved seed alongside synthetic fertiliser use.

FISP focuses on maize, groundnuts, pigeon peas, common beans, cotton and soya beans. Most other crops are produced and circulated mainly through farmer-managed seed systems. Both public and private sector R&D is focused on maize and a few other commercial crops. The Department of Agricultural Research Services (DARS), under MoAFS, tends to work on the same crops as private companies and neglects 'non-commercial' food crops.

High quality seed is critical to increase agricultural productivity. Seed is considered *the most critical agricultural input* because it places the upper limit on yield potential and influences the productivity of other inputs by determining the ability of crops to convert radiation, water, carbon dioxide and other nutrients into biomass (Mloza-Banda, et al., 2010). One of the objectives of the study was to understand the seed situation in Malawi with regard to access, practices among farmers, and the implications of these practices on agricultural productivity. Table 17 shows

Table 17: Percentage of households using seed types in the past season (N=91)

	Certified/hybrid	Non-certified/local (all)	Non-certified/local as % of those using this seed type	Total
Hybrid maize	72.5	0	0	72.5
Local maize	1.1	48.4	97.8	49.5
Beans	15.4	46.2	75.0	61.5
Groundnuts	38.5	41.8	52.1	80.2
Pigeon peas	9.9	2.2	18.2	12.1
Tobacco	41.8	34.1	44.9	75.8
Cow peas	2.2	14.3	86.7	16.5
Soya	26.4	39.6	60.0	65.9

the proportion of farmers who used either certified/hybrid or non-certified/local seed for major crops. AGRA is involved in supporting improved seed for all of these crops except tobacco, which already has its own commercial system managed by government and the tobacco industry.

The results show that apart from hybrid maize, the majority of farmers do not use certified/hybrid seed for the crops they cultivate. The high proportion of households using certified hybrid maize (72.5%) and tobacco (41.8%) can be attributed to FISP and contract tobacco farming, through which leading tobacco companies supply farmers with improved seed. High percentages given for the use of non-certified/local seed among farming households for the rest of the crops should not be surprising. This is because as many as 64% of the respondents reported saving seed for use in the subsequent growing seasons. According to one small agro-dealer to whom we spoke, there may be a market demand for local maize seed but it is illegal to sell it formally unless it has been properly tested and has been certified.

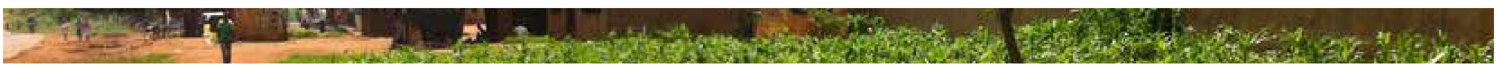
Table 18 shows the estimated quantity of seed used in the previous growing season (2013–2014) among farmers.

The amount of seed farmers acquired for most crops are spread evenly across the defined quantity categories. It is quite striking that the use of local maize rivals that of hybrid maize, yet the majority of the respondents in semi-structured interviews reported planting more hybrid than local maize. The proportion of

Table 18: Percentage of households acquiring seed by category in the past season (N=91)

	0.1-5 kg	5.1-10 kg	10.1-20 kg	>20 kg
Hybrid maize	28.4	22.4	29.9	19.4
Local maize	23.8	26.2	33.3	16.1
Beans	39.3	28.6	19.6	12.5
Groundnuts	19.2	12.3	45.2	23.3
Pigeon peas	100	0	0	0
Cow peas	100	0	0	0
Soya	56.7	25	10	8.3

	0.1-10 g	10.1-20 g	20.1-50 g	50.1-300 g	>300 g
Tobacco	32.8	14.8	18.0	16.4	18.0



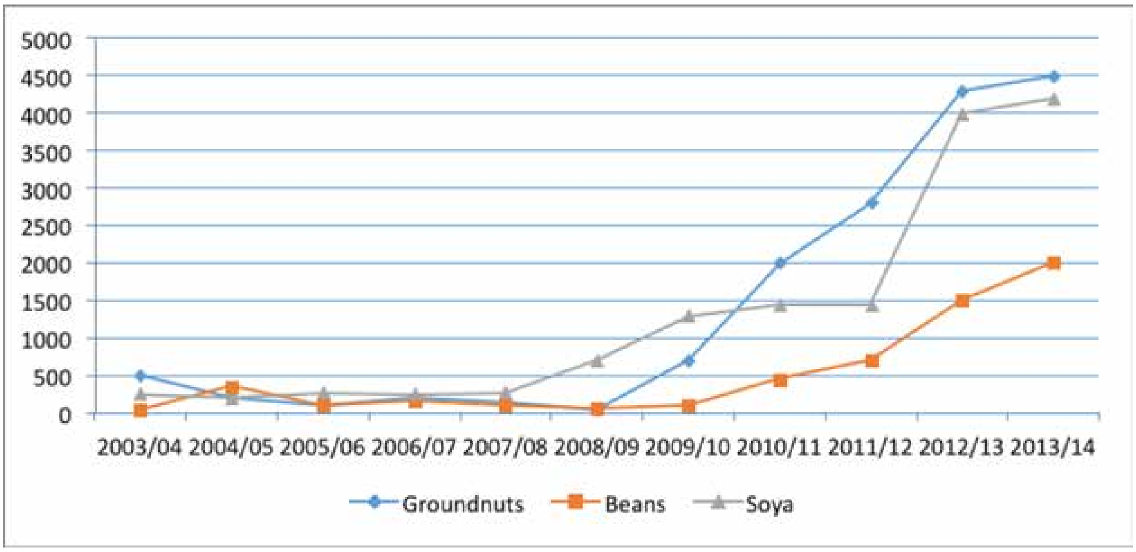
farmers using more than 10 kg of groundnut seed stands out at 68.5%. More than half of households indicated they saved their own groundnut seed. Consumption and yield data indicates groundnuts are one of the primary food sources for households participating in the survey. The majority of farmers are planting between 0–5 kg of pigeon peas, cow peas and soya. This is perhaps due to the shortage of legume seed in the country, as shown in Figure 7. It may also be that these are still in the experimental phase, with NASFAM's loan scheme starting from a low base. Low usage could suggest that most of the seed is coming from outside the local area and farmers are not saving local varieties of these crops. It is unlikely that local varieties have been displaced given the small amount of certified seed being taken up.

Although legume seed is an integral part of the FISP, most farmers reported that it is very difficult to access. The apparent boost to the proportion of farmers planting relatively larger volumes of soya and groundnut seed could perhaps be attributed to the Presidential Initiative on Hunger and Poverty Reduction, which made soya and groundnut seed available to farmers on a large scale, while AGRA facilitates work on improved legume varieties. The volumes of tobacco seed are relatively larger because tobacco is the primary cash crop in the country and the study was conducted in leading tobacco-growing districts.

Farmers were asked to provide the sources of the seed they had planted in the past growing season. Table 19 shows the various sources from which farmers acquired the seed used in their gardens.

The table provides an interesting picture of the varied sources from which farmers acquire their seed. However, it is very clear that the practice of saving seed is very well established in Malawi. The highest proportion of most seed, except for hybrid maize and pigeon peas, reportedly came from own saved seed: local maize (80%); beans (64.3%); groundnuts (54.8%); tobacco (40%); cow peas (73.3%); and soya (54.2%). As noted earlier, 64% of the respondents reported that they practiced seed saving. Farmers also practice seed exchange, both within and outside their villages. Our survey results show that this practice has some significance mainly for local maize and tobacco; around one-fifth of respondents who used these seeds indicated they had been acquired as a gift or through exchange. Hybrid maize seed is the only seed where the majority of farmers purchased from seed dealers (59%) compared with bean seed, the next most purchased, at 18%. FISP is another important source for maize hybrid seed and provided

Figure 7: Availability of legume seed in Malawi in metric tons



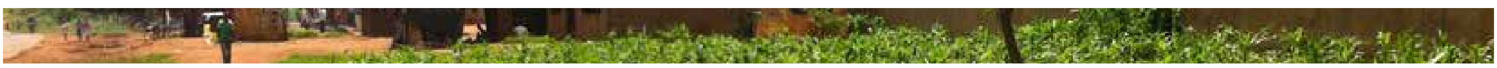
Source: Seed Traders Association of Malawi, 2014 around 11% of the total seed that was used. NASFAM and loans from tobacco companies are an important source of pigeon pea seed (60%) and tobacco seed (12.1%). NASFAM's introduction of pigeon pea was sponsored by AGRA, as indicated above. It is still too early to assess the impact of these interventions, given the small number of farming households (6) obtaining the seed from NASFAM and the small quantities of seed being used (less than 5 kg/household).

Thus far our research indicates that there is no systematic market in uncertified seed in the study sites. Saved seed may be shared with neighbours, friends or family but, as Table 19 shows, this is not a large source for seed. The same is true for sales between farmers. Amongst the survey respondents, farmers tended to save seed primarily for their own use, with small bulking up experiments being conducted through NASFAM, mainly with peas and groundnuts. At present, in the study sites, bulking up takes place on small plots and the seed is graded by NASFAM and the farmers. NASFAM circulates good quality seed for legumes for three years before selling it off as grain/food.

Government policy is oriented towards the introduction of improved seed into farming systems and there is no practical support for the saving and exchange of uncertified seed. Although maize is the staple food crop and a high portion comes from certified seed, it makes only a small contribution to overall nutrition and dietary diversity. Other major food crops such as groundnuts and beans are more often based on saved uncertified seed. These contribute significantly to dietary diversity yet receive limited support, and the objective of government and AGRA alike is to

Table 19: Percentage of households reporting source of seed acquired in the past season (N=91)

	Hybrid maize (66)	Local maize (45)	Beans (56)	Groundnuts (73)	Pigeon peas (10)	Tobacco (70)	Cow peas (15)	Soya (59)
Purchased seed dealer	**59.0**	4.4	17.9	9.6	0	17.1	0	13.6
NGO/charity	4.5	2.2	1.8	11.0	10.0	2.9	6.7	13.6
Own saved seed	3.0	**80.0**	**64.3**	**54.8**	20.0	**40.0**	**73.3**	**54.2**
Gift/exchange within village	6.1	**6.7**	5.4	4.1	0	**15.7**	0	5.1
Gift/exchange from outside village	0	**11.1**	5.4	0	0	**5.7**	0	1.7
NASFAM – loan	9.1	0	0	15.1	**60.0**	0	6.7	3.4
NASFAM – free	3.0	0	0	1.4	0	1.4	0	0
Vendor/temporary dealer	1.5	0	1.8	0	0	0	6.7	1.7
Tobacco company – loan	**12.1**	0	1.8	0	0	14.3	0	1.7
Tobacco company – free	3.0	0	0	0	0	1.4	0	0
FISP	**10.6**	0	1.8	2.7	0	0	0	1.7
Purchased from other farmer	1.5	0	3.6	5.5	0	0	6.7	5.1
Other	1.5	0	0	0	10.0	1.4	0	0



replace these uncertified seeds with certified varieties. Although there may be an element of improvement in the germplasm, farmers indicated on various occasions that certified varieties lack some desirable characteristics related to storage, taste, etc. Replacement by certified varieties may have negative impacts on the diversity of seed available and this is an aspect that requires further investigation.

Table 20 shows the average cost of seed used by farmers in the past growing season.

The results clearly show that the average costs are substantially higher for hybrid maize and tobacco seed. This should not be surprising because 59% of total hybrid maize used was reportedly purchased from designated seed dealers. The FGDs inferred that the high average prices of tobacco seed could be attributed to hidden costs arising from the input packages that must be repaid after sales. The fact that farmers incurred no expense in procuring seed for a bigger proportion of most crops—local maize (85.3%); beans (58.5%); groundnuts (63.6%); pigeon peas (100%); tobacco (71.1%); and cow peas (77.8%)—underscores the fact that the practices of seed saving and exchange are very well established in Malawi. This is a clear indication that seed prices will rise with the introduction of GR technologies, although farmers do weigh the costs and benefits (e.g. increasing yields) for their households, in the short term at least.

A high proportion of farmers indicated that they did not incur any costs when procuring hybrid maize seed. When we look at the sources of hybrid maize beyond purchases (Table 19), loans from tobacco companies and NASFAM, FISP, and some cases of exchange and NGO provision become evident. These farmers might have also used Demeter seed accessed through FISP. As a strategy to promote its seed, which is relatively new on the market, Demeter Seed Company does not require farmers to pay the prescribed top-up sum of MK 150. Demeter Seed is a subsidiary of Farmers World Group which also runs a wide agro-dealer network.[15]

Farmers were also asked to assess the quality of the seed that they had used in the past growing season and to rate it as good, acceptable or poor. The results of their assessments are presented in Table 21.

The results show that most farmers considered the seed of good quality. Certified seed was consistently ranked higher than uncertified/local seed, but a fairly high proportion of respondents indicated that even uncertified/local seed is of good quality. Opinions ranged from 62.8% for local maize up to 81% for uncertified/local bean seed. It is quite striking that 100% of respondents (although the sample size was small) considered both certified and uncertified seed to be of good quality. It is likely that certified pigeon pea seed from NASFAM's loan programme was

Table 20: Percentage of households indicating cost of seed acquired in the past season (N=91)

	None	MK 1–MK 2,000	MK 2,001–MK 5,000	MK 5,000–MK 10,000	>MK 10,000	Average spent on seed (MK)
Hybrid maize	17.4	30.4	19.6	6.5	26.1	5,942.39
Local maize	85.3	11.8	2.9	0	0	144.40
Beans	58.5	29.3	12.2	0	0	622.68
Groundnuts	63.6	27.3	9.1	0	0	502.27
Pigeon peas	100	0	0	0	0	0
Tobacco	71.1	17.8	2.2	0	8.9	5,615.73
Cow peas	77.8	22.2	0	0	0	88.89
Soya	66.7	23.1	7.7	2.6	0	522.05

15. www.farmersworld.net

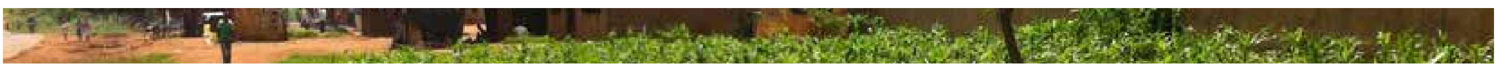
recycled and has retained its quality for the time being. Groundnuts were the exception, with uncertified groundnut seed (81.1%) ranked better than certified groundnut seed (68.6%). While the challenge of high seed prices is common across the study sites, it is more pronounced in Nambuma (86.2%) than in Chamama (76.7%) or Chipala (69%). The problem of poor quality seed is highly prevalent in Chipala (27.6%), followed by Nambuma (24.1%); and is least prevalent in Chamama (13.3%).

Hybrid or local maize

Mloza-Banda *et al.*, (2010) indicate a slightly higher use of hybrid maize than local maize in the Central Region of Malawi in 2010 (Table 22), although more than half the farmers were using local varieties as well. Our survey results show that although farmers were using both hybrid and local maize seed, significantly more (73%) were using hybrid seed while local maize seed was being used by only 50% of the sample. Almost one-fifth of farmers (18.6%) in

Table 21: Farmers' assessment of seed quality used in the past season (%) (N=91)

	Good	Acceptable	Poor
Hybrid maize—all types	84.8	7.6	7.6
Hybrid maize—certified	**84.8**	7.6	7.6
Hybrid maize—uncertified/local	0	0	0
Local maize—all types	61.4	20.5	18.2
Local maize—certified	0	100	0
Local maize—uncertified/local	**62.8**	18.6	**18.6**
Beans—all types	82.1	16.1	1.8
Beans—certified	85.7	14.3	0
Beans—uncertified/local	**81.0**	16.7	2.4
Groundnuts—all types	75.0	9.7	15.3
Groundnuts—certified	68.6	14.3	17.1
Groundnuts—uncertified/local	**81.1**	5.4	13.5
Pigeon peas—all types	100	0	0
Pigeon peas—certified	100	0	0
Pigeon peas—uncertified/local	100	0	0
Tobacco—all types	75.7	7.1	17.1
Tobacco—certified	**81.1**	2.7	16.2
Tobacco—uncertified/local	**67.7**	12.9	19.4
Cow peas—all types	80.0	6.7	13.3
Cow peas—certified	100	0	0
Cow peas—uncertified/local	76.9	7.7	15.4
Soya—all types	78.0	10.2	11.9
Soya—certified	87.0	8.7	4.3
Soya—uncertified/local	72.2	11.1	16.7



the survey described local maize seed as poor. In the semi-structured interviews and FGDs farmers generally recognised the superiority of hybrid maize in terms of productivity and adaptability to erratic weather patterns.

Table 22: Maize cultivars in use, 2010

	North	Central	South	Malawi
Local varieties (%)	38	55	62	56
Composite varieties (%)	5	6	7	7
Hybrid varieties (%)	58	67	59	55

Source: Mloza-Banda, 2010:13

Official advice is not to recycle hybrid maize seed, and to plant early maturing varieties. Although farmers generally appear to subscribe to this, half the households continued to use local maize. Some farmers use local maize seed from choice while others are forced by circumstances to use it. Those who use local maize seed from choice cite several attributes that make it attractive. These include: 1) local maize seed is more resistant to pests and diseases; 2) maize flour made from local maize lasts longer than that from hybrid maize, because one requires less of it to prepare the same amount of nsima (porridge); 3) fresh local maize tastes better (is sweeter) than hybrid maize and has a particularly good flavour when it is roasted; 4) local maize seed does not generate excessive husks when it is pounded; and 5) *nsima* made from local maize flour tastes better than that made from hybrid maize flour.

Farmers who use local maize seed from choice usually reserve it for consumption and not for sale, while they cultivate hybrid maize principally for sale. Some farmers indicated they are not concerned with the productivity of local maize because it is meant entirely for consumption. According to one of the farmers interviewed "it is not its [local maize seed] nature to be productive". At Chipala in Kasungu, most farmers planting local maize seed use a variety popularly known as Katumani or Katayamnyontho. This local maize seed is in high demand because "it rivals hybrid in terms of early maturing, but it is not as productive as hybrid". Most farmers observed that it matures faster than most hybrid maize varieties classified as early maturing. In this regard, Katumani was consistently described as being very important because it helps farmers get past the hunger season as quickly as possible.

Those farmers who are forced to use local maize seed attributed their predicament to poverty. They argued that much as they may want to switch to growing hybrid maize, they are unable to do so because they simply cannot afford it. Some pointed out that they use hybrid maize when they are FISP beneficiaries, but often the amount of seed they receive is inadequate for their needs. Box 1 captures the sentiments of some of the farmers who are forced to use local maize seed because they cannot afford to access hybrid maize seed on their own.

Box 1: Farmers' sentiments on the use of local maize seed

I cannot afford to buy hybrid maize seed for my entire garden but even if I could, I would still devote part of my garden to growing local maize.

I use local maize seed because I cannot simply afford to access improved maize seed; my poverty is simply too much for me to afford seed given that I am never considered for FISP.

I am compelled to use local maize seed because I cannot afford to access improved seed. When I am fortunate enough, I sometimes complement local maize seed with hybrid maize seed obtained through FISP.

I use local maize seed because I find it difficult to access improved maize seed, otherwise if I had the means I would have completely switched to hybrid maize.

The semi-structured interviews and FGDs revealed that most farmers have been forced to switch from local to hybrid maize due to the changing rainfall patterns since the turn of the 1990s. They indicated they would prefer to be growing local maize but doing so is

increasingly considered a huge gamble, due to the erratic rainfall patterns. While farmers acknowledge that hybrid maize is more productive than local maize, most of them emphasised they have been enticed to switch to hybrid maize because it is productive even when the rains are generally problematic. And since the rains are becoming increasingly erratic as a matter of routine, farmers in one of the FGDs argued that "it is simply common sense to switch to hybrid maize".

Nevertheless, it is important to note that in choosing which variety of hybrid maize to grow farmers are greatly influenced by the specific attributes of local maize. Most farmers indicated that they settle for hybrid maize varieties that are fast maturing, fairly resistant to pests and diseases, do well with limited rainfall, and are poundable without huge losses. The latter characteristic is considered particularly important by the majority of farmers, and frequently cited varieties were DK 8033 and DK 8073. These are both Monsanto hybrids and both are considered very productive and fast maturing. However, most farmers indicated they grow DK 8033 predominantly for sale and DK 8073 for consumption, since the latter has better poundability characteristics than the former. According to the agro-dealers and extension workers interviewed, the question of which hybrid maize variety to choose is not an easy one, particularly in the context of erratic rainfall patterns. This is because there is some sort of trade-off between early and late maturing hybrid maize varieties. Early maturing hybrid maize varieties are not as productive as the late maturing varieties.

Seed selection and recycling

As established by the survey, seed saving is practiced widely in Malawi. To reiterate, up to 64% of the respondents reported they practiced seed saving. This should not be surprising because although an increasing proportion of farmers use hybrid maize seed, the majority of farmers in Malawi still use local maize seed. Farmer interviews and FGDs established that some farmers using hybrid maize seed recycle the seed for use in the subsequent growing season. Farmers are aware that hybrid maize seed is not supposed to be recycled because it loses its productivity vigour. However, they are forced to recycle for two reasons: 1) once they have had the opportunity to access improved seed, mainly through FISP, they are unable to access fresh seed on their own due to poverty; 2) the fact that the first serious rains come when they are not financially ready to procure fresh seed from designated seed dealers. These farmers are concerned about the potential of an erratic rainfall season which would have disastrous consequences.

Box 2: Recycling hybrid maize seed

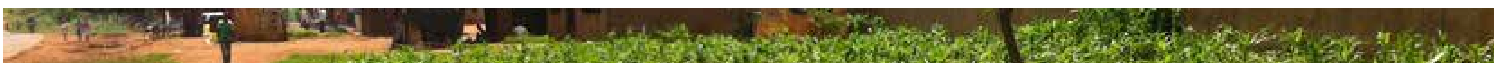
I do recycle hybrid maize seed just to be on the safe side because one cannot always be sure of getting FISP inputs in time for planting with the first rains.

I do keep some seed whether local or hybrid just as a matter of getting prepared for the farming season in case I am unable to buy seed to plant with the first rains.

I keep hybrid maize seed because I fear that I may not have the money to buy seed in case I am not a beneficiary of FISP but also because I want to be always prepared. The changing rainfall patterns have taught me to be always prepared.

I save some hybrid maize seed even though I know we are not supposed to recycle hybrid maize. I still do it because it is not only difficult for me to buy fresh seed but also the rains are often highly unpredictable. One needs to have seed to plant in case you may not have money to buy fresh seed from agro-dealers when the first rains come.

The principles for seed selection from either local or hybrid maize are essentially the same. Farmers target strong and healthy cobs for seed selection. In particular, farmers look for maize cobs with very big, shiny and undamaged kernels. Once these cobs have been identified, the practice is to shell off and discard the kernels at both ends of the cob, retaining only those in the middle. The rationale for this is that kernels at either end of the cobs tend to be smaller and are at higher risk of pest and disease attack. These kernels



therefore do not make good seed.

The kernels in the middle of the cobs are then shelled off and stored as seed for use in the subsequent growing season. While little distinction is made between seed for replanting and seed for grain, some farmers tend to select the best seed for replanting. The seed is preserved using either traditional or modern methods. Traditional means of preserving the seed include mixing the seed with ashes or sand or hanging the storage pack over a fire place. The prevalent modern method of preserving selected seed entails spraying it with acteric or other related pesticides. The overall idea is to preserve the integrity of the seed, tensuring that once planted it achieves an acceptable germination rate. Seed sales are not a priority for these farmers although some expressed interest in exploring this aspect. This would apply less to maize seed and more to other types of seed and crops.

As noted in the survey results, the practice of seed exchange both within and beyond villages does occur but is not widespread. Seed exchange across local boundaries is a crucial source of new varieties into farmer-managed seed systems (Almekinders and Louwaars, 2002). Farmers exchange seed both within and outside villages, mostly with relatives and friends. Some farmers indicated they have been using the same seed for over 20 years, partly because it has been maintained through a closely knit network of friends and relatives. This was raised mainly in relation to the fact that most farmers are unable to maintain seed in a fairly good condition for longer than five years, because they tend to keep it to themselves. This was attributed partly to the apparent increase in the commercialisation of social relations, triggered by the fact that most of the seed used by farmers was either bought from the market or obtained on loan. Farmers are thus reluctant to share, for free, saved seed that they had initially bought or obtained on credit.

Seed use and household food security

Regarding seed we explored the relationship between certified and non-certified/local seed use for major crops (maize, beans and groundnuts) and dietary diversity, as well as the ability of households to eat the foods they are used to.

For maize there is no major difference between certified and uncertified/local varieties (Table 23) in terms of household dietary diversity. For beans and groundnuts, uncertified/local varieties tend to have a stronger correlation with improved dietary diversity.

Hybrid maize and certified bean seeds show a slightly more positive correlation with households being able to eat the foods they are used to, while uncertified/local groundnut varieties show a similarly more positive correlation than certified groundnuts (Table 24).

Overall, there is an uneven relationship between seed type and food security on the basis of these measures. Hybrid maize shows a somewhat more positive relationship to food security than local/uncertified maize. But the

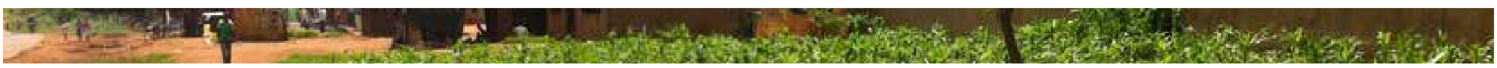
Table 23: Percentage of household using hybrid or local seed by dietary diversity (N=91)

Seed use	Food groups consumed in previous three days		
	3 or fewer	4-7	8+
Hybrid maize	7.6	15.2	77.3
Local/uncertified maize	6.8	18.2	75.0
Certified beans	0	28.6	71.4
Uncertified/local beans	4.8	9.5	85.7
Certified groundnuts	8.6	14.3	77.1
Uncertified groundnuts	2.6	13.2	84.2

Table 24: Percentage of households using hybrid or local seed by household unable to eat foods it is used to (N=91)

Seed use	HH unable to eat foods it is used to in the previous year		
	Often/always	Sometimes	Seldom/never
Hybrid maize	21.9	43.8	34.4
Local/uncertified maize	40.5	31.0	28.6
Certified beans	14.3	42.9	42.9
Uncertified/local beans	25.0	37.5	37.5
Certified groundnuts	28.6	42.9	28.6
Uncertified/local groundnuts	23.5	41.2	35.3

reverse is true for beans and groundnuts, with uncertified or local varieties showing a more positive correlation with food security than certified seed. We must recall that correlation does not imply causation. From the baseline, there is not a strong correlation between household food security and the type of seed (certified/uncertified) used. We will track this measure in future surveys to see if any trends emerge.



AGRICULTURAL PRACTICES AND SOIL FERTILITY

Agricultural practices

Table 25: Percentage of farmers implementing agricultural practices in the last season

Practice	% yes
Making and using compost	47.3
Nitrogen-fixing trees	34.1
Green manures	26.4
Animal manures	**58.2**
Mulching*	35.6
Permanent beds*	18.9
No burning (leaving crop residues)	**62.6**
Small-scale irrigation	34.1
Seed saving	**61.5**
Crop rotation	**83.5**
Intercropping in main field*	51.1
Cultivation during all seasons*	23.3
No till or minimum tillage*	**61.1**
Planting food trees	48.4
Contour planting	35.2
Swales (a marshy depression between ridges)	13.2
Grey water harvesting	4.4
Rainwater catchment	18.7

N=91 except *N=90

We provided respondents with a list of production practices and asked whether farming households engaged in any. A surprisingly high number of households engaged in some kinds of agro-ecological practices. Overall, more than eight out of ten households practiced crop rotation, around six out of ten households practiced leaving crop residues, seed saving, no till or minimum tillage, and the use of animal manure (Table 25). Ecologically sustainable water practices were lowest, specifically grey water harvesting, use of swales and rainwater catchment. This immediately indicates that agro-ecology is not something new that must be introduced to farmers but is part of what are considered 'traditional' practices, which in the GR view are considered obsolete and due for replacement by laboratory-based technologies.

Beans, pumpkins and hybrid maize were the main crops being intercropped (Table 26). Although farmers reported intercropping with some tobacco and pumpkins, tobacco companies frown on this as the crops come from the same family and diseases can be spread between the crops. Sweet potatoes and groundnuts tend not to be intercropped. Farming households in Nambuma tended to intercrop the most and those in Chipala the least.

We grouped practices based on the CA principles as follows: no or minimum till and/or permanent beds in one group, mulching and crop residues in another group, and crop rotation and intercropping in a third group, to see how many farming households were implementing any of these. This core definition is rooted in agro-ecological practices, and it is the addition of herbicides, synthetic fertilisers and certified seed use that threatens to shift CA into the GR paradigm. More than 60% of households engaged in minimum till and ground cover practices, while 85% practiced some form of crop rotation or intercropping (Table 27). Almost nine out of ten farming households applied some kind of organic content to the soil. This offers a very strong basis for the development of agro-ecological methods, since these practices are already being implemented and do not need to be introduced from external sources.

Agricultural practices and household food security

One of the primary objectives of the research is to see what impact agricultural practices have on household food security. This report presents the results of our baseline study, i.e. a first measure of these practices and their impacts on household food security. We are tracking many variables, starting with the relationship between production practices and household food security. To do this we first

Table 26: Types of crops intercropped in main field (percentage of households) (N=91)

Crop	# of producing HH	All	Chamama (N=30)	Chipala (N=31)	Nambuma (N=30)
Hybrid maize	69	**60.1**	70.4	31.8	80.0
Local maize	51	52.9	77.8	22.2	66.7
Beans	74	**83.8**	80.0	72.7	96.3
Groundnuts	81	18.5	7.4	10.7	38.5
Pigeon peas	15	46.7	28.6	50.0	75.0
Tobacco	76	35.5	38.5	23.1	45.8
Cow peas	31	25.8	42.9	0	25.0
Sweet potatoes	44	6.8	0	0	17.6
Soya	68	30.9	9.1	18.2	62.5
Pumpkins	54	**66.7**	75.0	87.5	50.0
Tomatoes	18	55.6	50.0	-	60.0

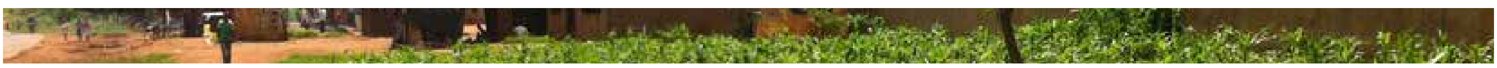
Table 27: Conservation agriculture practices (N=91)

Practices	%
Farmers practicing no till or permanent beds or both (group 1)	62.9
Farmers practicing mulching or crop residues or both (group 2)	64.8
Farmers practicing crop rotation or intercropping or both (group 3)	84.6
Farmers adding organic content (any of compost, green manure, animal manure, mulching, crop residues)	87.9
Farmers practicing in just one of the CA groups	25.3
Farmers practicing in two of the CA groups	31.9
Farmers practicing in all three of the CA groups	40.7
Farmers practicing in any of the CA groups PLUS adding organic content	85.7

looked at the relationship between agricultural practices and dietary diversity.

CA1 indicates households practising just one of the three defined conservation agriculture components; CA2 defines households practising two of the CA components; CA3 describes households practising all the CA components; and CA4 indicates households practising any of the CA components plus the use of manure or compost to increase the organic content of the soil. (The organic content of the soil will obviously be high, since most households interviewed added organic content to the soil.) CA0 defines households not engaged in any CA components. There were just two households in this category, despite efforts to look for farmers not practicing any of these techniques. Our hypothesis is that households practising more of the CA components plus using manure and compost should have greater dietary diversity. That is, ecological production practices will translate into improved food security over time.

To reiterate, this study is only the baseline and many other variables will influence this relationship, not least the relative wealth of the household. But if we track the relationship over time, as we plan to do, we may be able to identify a causal relationship between production practices and dietary diversity, as one measure of food security. Having said that, the baseline study does indicate that



households with less dietary diversity are also those households that engage in fewer CA practices (Table 28).

Table 28: Percentage of households in CA groups by dietary diversity (N=91)

Agricultural practices	Food groups consumed in previous three days		
	3 or fewer	4-7	8+
CA0	50.0	50.0	0
CA1	13.0	21.7	69.6
CA2	6.9	10.3	82.8
CA3	2.7	13.5	83.8
CA4	5.1	9.0	85.9

A different angle is to look at the relationship between agricultural practices and the extent to which households were able to eat the foods they are used to in the previous year. We hypothesise that over time, households engaged in more agro-ecological practices (for now structured around the core CA definition) will be more likely to be eating the foods they are used to (Table 29).

Table 29: Percentage of households in CA groups unable to eat what they are used to (N=91)

Agricultural practices	HH unable to eat the foods they are used to in the previous year		
	Often/ always (%)	Sometimes (%)	Seldom/ never (%)
CA0	100	0	0
CA1	40.1	45.5	13.6
CA2	35.7	28.6	35.7
CA3	17.1	42.9	40.0
CA4	26.7	40.0	33.3

The question is not well formulated in that it contains a double negative. Basically, households that say seldom/never mean they are always able to eat the foods they are used to, while those that say often/always are seldom or never able to eat the foods they are used to.

The baseline data shows that the percentage of households unable to eat the foods they are used to in the past year declined as the extent of involvement in CA practices increased. CA4 does not follow from CA3 in a linear way, because it defines households practising any of the CA components plus manure, and includes most households in the sample, whereas households are found in only one of the CA0–CA3 categories.

Synthetic fertiliser use

While the majority of households are engaged in at least some agro-ecological practices, many households also apply synthetic fertiliser to the land every year. Due in large part to the recent history of input subsidies, synthetic fertiliser use among small-scale farmers in Malawi is relatively high compared with the rest of sub-Saharan Africa. It became apparent very early in the research that fertilisers are probably the single biggest issue in Malawian agriculture, and that farmers are becoming trapped in a vicious circle of ever-increasing fertiliser prices combined with ever-decreasing yield returns. Focus group participants were incredulous upon hearing of the fertiliser use target of 50 kg per ha within the Abuja Declaration, saying they are already achieving disappointing harvests using significantly more than this figure.

Fertiliser use is very high in the areas surveyed, both in terms of overall users and quantities applied. NPK as basal (67.8%) and urea as top dressing (81.1%) were used by the largest numbers of farmers overall (Table 30), owing to their use (and association) with maize production. A wide variation in numbers of users was reported between the three areas surveyed; both types were being used in Chamama by more than 90% of respondents; this figure fell to 73.3% and 46.7% for urea and NPK respectively, in Nambuma. There were also noticeable variations between the districts for users of CAN and Super D/D compound, the two principle fertilisers used in tobacco production. This could indicate either a variation in tobacco cultivation at the district level, or a variation in resources to access sufficient quantities of fertiliser.

Table 30: In the past year did you use the following fertilisers?

Type of fertiliser	% yes (N=90)	Chamama % yes (N=30)	Chipala % yes (N=30)	Nambuma % yes (N=30)
Urea base	12.2	6.7	30	0
Urea top	81.1	93.3	76.7	73.3
NPK base	67.8	90	66.7	46.7
NPK top	3.3	3.3	6.7	0
CAN base	3.3	0	10	0
CAN top	25.6	43.3	10	23.3
Animal manure	45.6	63.3	50	23.3
Green manure	14.4	13.3	13.3	16.7
Super D (N=88)	20.5	53.6	10	0
Other	1.1	0	0	3.3

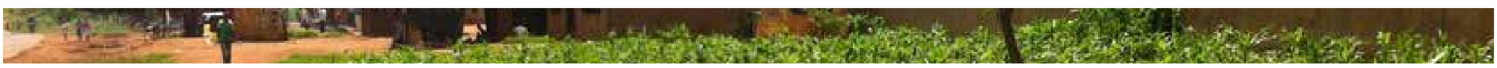
The application rate of fertiliser also appears to be very high; among respondents who confirmed using any kind of synthetic fertiliser the mean application was 341.5 kg (Table 31). This varied between types of fertiliser, with mean application rates for NPK (especially 23:21:0) as a basal fertiliser, and urea for top dressing at 150.2 kg and 131.7 kg respectively. For CAN and Super D, application rates were 154.8 kg and 230.6 kg respectively.

A Pearson Chi-square test of statistical significance (score of .389) indicates no statistically significant relationship between respondents indicating soil infertility as a serious issue and amount of fertiliser used. There appears to have been little or no soil testing conducted in the areas surveyed, with some farmers not even aware that soil could be tested. One focus group participant reported having a soil sample taken by somebody working for the tobacco company in a previous season, but received no subsequent feedback. The majority of farmers are unaware of the different components within the fertiliser blends they are using.

High fertiliser prices were identified as a 'serious' problem by 98.9% of respondents. One respondent told of prices more than doubling

Table 31: Mean amount of fertiliser applied in the past year

Type of fertiliser	N (all)	Mean kg applied all respondents	N (those using)	Mean kg applied only respondents using fertiliser
Urea base	90	9.2	11	75
Urea top	89	106.5	72	**131.7**
NPK base	90	101.8	61	**150.2**
NPK top	90	1.1	3	31.7
CAN base	90	3.9	3	116.7
CAN top	88	36.9	21	154.8
Super D/D compound	88	47.2	18	**230.6**
Total (synthetic)	90	303.53	80	**341.5**
Animal manure	87	1,151.8	39	2,569.5
Green manure	89	180.0	11	1,456.4



within the space of a year, from MK 7,000 for a 50 kg bag in 2012 to MK 16,000 at present. From Table 32 it is clear that farmers are spending relatively high amounts on fertiliser. The overall average spent on fertiliser was MK 95,500 per household. This is more than the market value of 1.5 tons of maize at MK 60/kg in local markets. The average spent on urea for top dressing of the 63 farmers who reported using it was over MK 27,000, rising to nearly K32,000 in the case of NPK basal fertiliser (for 55 farmers using it).

The timely delivery of fertilisers is crucial to their effective use, with late deliveries (particularly in respect of subsidised fertiliser) a common problem cited in the growing literature (Chirwa and Dorward, 2013). Farmers in FGDs in Chamama indicated that fertiliser is available in the shops but they do not have enough money to purchase it when needed. While not appearing as significant a problem as costs, 39.7% of respondents indicated it was a serious problem, with another 24.1% calling it a moderate problem. Again, this appears to be a bigger concern for female than male farmers (see Table 3).

As indicated in the section of production and yields above, hybrid maize yields were on average 519 kg more than local maize yields. At the prevailing market price of MK 60/kg (US$ 0.14) this translates into a potential additional income of MK 31,140/household (US$ 74.14). However, this does not justify the additional average input costs of MK 5,798 (US$ 13.80) for hybrid maize seed plus MK 81,296 (US$ 193.54) for NPK and urea which are used primarily on maize. When increased input costs are taken into account, farmers adopting GR technologies realise a potential income deficit of MK 55,954 (US$ 133.22). Even if the synthetic fertiliser is also shared among other crops, it is highly unlikely that farmers will realise a net profit by adopting these technologies. The short-term benefit of higher yields masks this net transfer from small-scale farming households to seed and fertiliser agribusinesses.

Despite FISP's size and cost, more farmers purchased urea and NPK (44.7% and 44.4% respectively) from agro-dealers than received from FISP (36.8% and 25.4% respectively) (Table 33). As with seed, the major agro-dealers such as Farmers' World and Kulima Gold are dominant over the smaller ones sponsored by AGRA via CNFA, although the latter do play a role in getting seed especially to resource-poor farmers by repackaging into smaller, more affordable units. This is especially the case in fertiliser where FISP subsidies direct farmers towards outlets that accept coupons.

Table 32: Mean amount paid for fertiliser applied in the past year

Type of fertiliser	N (those using)	Mean payment (MK) by respondents using fertiliser	Mean payment (US$) by respondents using fertiliser
Urea base	11	19,204.55	45.73
Urea top	63	27,544.52	65.58
NPK base	55	31,780.09	75.67
NPK top	3	2,766.67	6.59
CAN base	3	32,800.00	78.10
CAN top	18	36,077.78	85.90
Animal manure	26	1,134.62	2.70
Green manure	9	777.78	1.85
Super D/D compound	9	65,516.67	155.99
How much on total fertiliser applications where breakdown between types in unknown	8	307,641.25	732.48
Total	79	95,415.70	227.18

Significant numbers of farmers accessed CAN and Super D/D compound through the tobacco companies (30.8% and 50%) as part of their tobacco input packages. Over a quarter (27.8%) of farming households purchased CAN and Super D/D compound from agro-dealers. More farmers thus purchased CAN from agro-dealers than received it from the tobacco companies. This could indicate that the quantities of CAN included in tobacco input packages (generally 100 kg) do not equate to sufficient yields. It indicates a market for these synthetic fertilisers that may signify the presence of a better-resourced layer of farmers able to invest in inputs.

Farmer's perceptions on soil fertility were mixed, with reports of both degradation and improvement over time. Reports of improvements tended to come from farmers who had recently adopted CA or planted nitrogen fixing trees. Overall, 53.3% of respondents highlighted soil fertility as a serious challenge to farming, though there was a considerable gender difference as 63.6% of women agreed with this statement, compared to 43.5% of men. This difference could have something to do with the type and quality of land men and women have access to. In FGDs farmers indicated they were applying a lot of fertiliser but were not getting the benefits, and expressed keen interest in participating in farmer to farmer exchanges where organic methods were being practiced. Participating farmers said seeing these methods in practice would "energise" them. Given that the participating farm households are using high levels of synthetic fertiliser, the findings suggest that GR technologies do not lead to improved soil conditions. Pumping synthetic chemicals into the soil does not necessarily improve the condition of the soil or make farmers' lives easier.

Organic soil fertility methods

Despite the use of synthetic fertilisers, which have become so embedded in Malawi's agricultural system (and consciousness), farmers in the survey also adopt a variety of other soil fertility practices as indicated earlier. Among the most widespread are crop rotation (83.5%), the application of crop residues (62.6%) and animal manures (58.2%), no or minimum tillage (51.7%) and intercropping (51.1%). Crop rotation, the application of crop residues (permanent ground cover) and no or minimum

Table 33: Where did you get the following fertiliser %? (N=91)

Source	Urea (76)	NPK (63)	CAN (26)	Super D/ D compound (18)	Animal manure (41)	Green manure (7)
Own production	0	0	0	0	97.1	100
agro-dealer	**44.7**	**44.4**	**38.5**	**27.8**	0	0
vendor / temporary agro-dealer	1.3	1.6	0	0	0	0
NASFAM	3.9	0	0	0	0	0
FISP	**36.8**	**25.4**	3.8	5.6	0	0
ADMARC	3.9	4.8	7.7	0	0	0
tobacco company	14.5	15.9	**30.8**	**50**	0	0
other company	2.6	3.2	3.8	5.6	0	0
other government	6.6	7.9	7.7	0	0	0
another farmer/villager	1.3	0	0	**16.7**	0	0
other	3.9	7.9	3.8	0	2.1	0

Some respondents answered more than one
Other government includes Malawi Revolving Development Fund (MARDEF), Smallholder Farmers Fertiliser Revolving Fund of Malawi (SFFRFM)

tillage are the three principle practices underlying the concept of CA, as discussed earlier.

The use of animal manure presents a potentially cheap and readily available source of external soil nutrients, and was used by 45.6% of farmers in the previous season (Table 34). Ninety-seven per cent of those applying animal manure said they did so from their own sources. We failed to gather information on livestock ownership and this will be remedied in the follow up survey. When asked in FGDs, women said they had a few small stock (goats, pigs and chickens) which could contribute a bit towards organic content to the soil, but not a lot. According to a survey conducted for AGRA in 2010, 63% of households in the Central Region (including respondents from Kasungu) owned some livestock in the past 12 months, mostly chickens and some pigs and only 7% of households had cattle (Jimat Development Consultants, 2012:23). In that survey, livestock ownership by households in the Central Region was slightly higher than the national average. In our FGDs in Chamama, farmers indicated they used to have more livestock, when the previous government was promoting livestock. But now there are no extension services anymore and there are problems with sickness and forced sales to generate cash. Cattle and horses are the key livestock for soil fertility. When these farmers were asked more about sources of animal manure, most said they got it from others with livestock and some who live near the large estates also got some manure from the estates.

Table 34: In the past year did you use the following fertilisers?

Type of fertiliser	% yes (N=90)	Chamama % yes (N=30)	Chipala % yes (N=30)	Nambuma % yes (N=30)
Animal manure	45.6	63.3	50	23.3

Under previous administrations animal ownership in Malawi was encouraged. However, since the liberalisation of Malawi's agricultural sector, small-scale farmers are often required to sell their animals in order to cover day-to-day expenses or to repay loans. This was reported in two of the focus groups where the issue of animals was discussed in some detail. Animal ownership has also been affected by dwindling government extension services. According to the chair of the local farmer committee, many people are not aware who or where their nearest government extension officers are. Though NASFAM and other NGOs have begun to fill the extension vacuum left by government, there was a general perception among participants that animal ownership has not yet reached previous levels.

Clearly there are challenges around animal ownership for small-scale farmers, though the roles they play for the family are varied and vital, from providing food and manure to a readily available source of finance. Livestock can also have a positive effect on grazing lands, helping to maintain grasslands which bind carbon in the soil (Savory and Butterfield, 1998; Schwartz 2013). An immediate benefit to improving access to sources of animal manure is its low cost compared to fertilisers. The mean payment for reported purchases of animal manure was MK 1,135 (US$ 2.70) compared to a mean payment of MK 95,416 (US$227.18) of all those who reported using synthetic fertilisers.

Water is another key determinant of soil fertility and its influence on agricultural production in Malawi, which has a relatively short rainy season and very little irrigation infrastructure, is clear to see. Contour planting, where ridges are constructed against the slope of a hill to prevent excess water run-off, was being practiced by 35.2% of farmers surveyed. Just over one third (34.4%) of respondents were practicing some form of small-scale irrigation, the majority of which was use of a watering can in their dimba, a small patch of land close to a river where a well can be dug (typically dimbas are used for vegetable production). For the majority of smallholder farmers, cultivation during the dry winter season is only possible in the *dimba*.

Many farmers reported digging their own wells, though this service is offered locally within some villages for a fee (MK 15,000/ US$ 35.71 was quoted). Water access has been improved by the construction of boreholes in some villages. Water from boreholes is free, though each household in the borehole's catchment area pays a monthly fee for its upkeep. The sheer number of users means that boreholes breakdown regularly, though having villagers trained in maintenance means boreholes are not usually out of action for more than a few days. Only 18.7% of participants questioned were practicing some form of rainwater harvesting while grey-water harvesting (i.e. water that has been used in the household) was even lower, at 4.4%.

The potential contribution of agro-forestry to soil health and agricultural production have long been recognised in Malawi, through work carried out by the Land Resources Centre (LRC) and ICRAF among others (Kimaro, et al., 2012). In the districts sampled general awareness of nitrogen-fixing trees was fairly widespread, and just over one third of farming households in the survey planted (34.1%). Tree types used include *mtete* (acacia), *tephrosia*, *glirisidia* and *msango* (*faidherbia albida* in the acacia family).

Though the LRC and ICRAF have been among the major suppliers of seedlings in Malawi, some of the farmers received seedlings from Limba Leaf and Premium Tama tobacco companies. During the drying stage of tobacco production, tobacco leaves are hung from wooden structures erected by the farmers, and the trees therefore have a dual use. Experiences with N fixing trees were mixed. Some farmers said they could see benefits to the soil (in terms of crop yields) though many of the tree seedlings given out during 2013 did not survive the very dry conditions of that year. Overall there was enthusiasm for N fixing trees among the farmers who participated in the research, with many who hadn't already done so interested in planting them in the future.

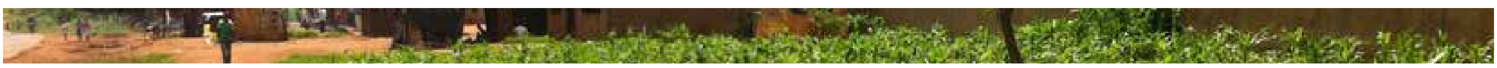
Despite lack of support for these practices, farming households are practicing a range of organic soil fertility techniques. AGRA approaches ISFM from the angle of bolstering the use of synthetic fertilisers as if this is the main weakness with existing practices. It is evident from the research, however, that high levels of synthetic inputs are not resulting in soil improvements. Table 35 shows key soil issues facing farmers. There may be some yield gains in maize and sporadically in other crops when synthetic fertilisers are used in conjunction with improved seed, but farmers indicated they needed to continue increasing inputs in order to maintain yields, and the quality of the soil is declining at the same time. If AGRA is serious about ISFM, it should also be putting resources into building and supporting methods that increase organic content in the soil.

Soil test results and analysis

This section provides an overview of a more detailed report submitted by Chitedze Research Station on soil sampling and analysis for 90 participating farmers in Kasungu and Dowa as part of the research project. There are many different materials needed for plant growth, including carbon dioxide (CO_2), water, oxygen, nitrogen, phosphorus, potassium, sulphur, calcium, magnesium, zinc, copper, boron, manganese, iron, molybdenum and chlorine. Oxygen and CO_2 are available in the air in abundance. The other nutrients are generally taken up from the soil. These are called essential nutrients because their deficiency makes it impossible for higher plants to complete their life cycles.

Table 35: Respondents indicating serious soil issues by area

Issue	Chamama % serious (N=30)	Chipala % serious (N=31)	Nambuma % serious (N=29)
Soil infertility	66.7	22.6	72.4
High fertiliser price	100	100	96.6
Late fertiliser delivery	43.3	35.7 (N=28)	72.4
Soil erosion	56.7	35.7 (N=28)	51.7



The goal of soil testing is to provide a guide to the expected contribution of particular soil nutrients and to predict the likelihood of getting a profitable yield response from the addition of specific fertiliser nutrients and other amendments. Soil chemical parameters collected included: per cent soil nitrogen, extractable phosphorus, potassium, per cent organic matter, per cent soil organic carbon, organic matter, soil pH, magnesium, manganese, sodium, calcium, zinc, iron, sulphur, cation exchange capacity (CEC) and base saturation[16]. Physical soil parameter measured was soil texture and bulk density. The soil samples were randomly collected on each farm. Soil samples were collected from 0 to 60cm at depth intervals of 20cm. Soil samples collected were then bulked to make a composite sample. Quartering method was used to come up with a desired sample that was bagged in a polythene bag ready for laboratory analysis. Soil samples for bulk density determination were collected using core samplers from each farm. Recommended laboratory analytical procedures were used to analyse targeted soil chemical and physical parameters. Analytical results were subjected for statistical analysis using GENSTAT software and significant means were separated using analysis of variance (ANOVA).

The dominant soil types in Kasungu are the lateritic soils. These are sandy loam soils reddish in colour. In some areas there are river and dambo colluviums, red clay and pure sandy soils. These are well-drained soils. These soils vary in thickness. The soil pH ranges from 5.0 to 7.6, suitable for growing maize, tobacco and legumes. The soils in Dowa are generally ferruginous latosol (alfisol) and medium-textured sand clay loam. The soils are acidic to alkaline in reaction with the pH values ranging from 4.6-8.4 in the 0-45cm.

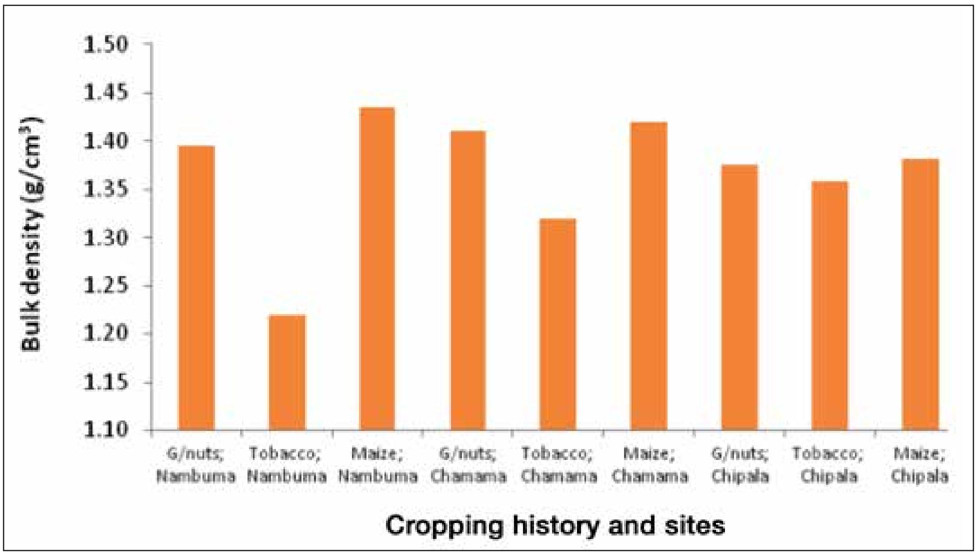
Minimal differences existed among sites on soil texture composition. The soils at all sites were relatively dominated by clay proportion with lower silt content. Medium clay content provides soils with the ability to hold water with less nutrient leaching. It enhances process of cation exchange between the soil solution and the exchanging sites, making nutrients available for plant uptake. This explains why the soils in Kasungu and Dowa are productive.

Higher ***bulk density*** values imply that soils are compacted with no ability to enhance oxygen necessary to energise microbes responsible for efficient decomposition and holing of the soil. Higher values impede water infiltration, resulting in erosion of soluble nutrients and physical soil aggregates causing problems in water bodies. This strongly explains why most sample sites had low concentrations of soil nitrogen and organic carbon below minimum threshold. In Chipala, there were no significant differences in bulk density in sites with different crops (groundnut, tobacco and maize), although maize mono-crops gave slightly higher values (Figure 8). The bulk density values were very high close to the critical value of 1.5. At Nambuma and Chamama, changes in bulk density showed similar trends. At both sites, the highest values were obtained from maize mono-cropping with mean values close to critical values of 1.5. In the fields where tobacco was cultivated lowest mean values were obtained because manure was applied. Generally speaking, these soils are deficient of significant microbial populations. They are degraded due to intensive cultivation through mono-cropping, making them vulnerable to parasitic weed infestation e.g. Striga asiatica. Based on the status of soil physical conditions, there is a need to initiate programmes that will assist to restore degraded soil before they worsen.

Mean ***soil pH*** was between 5.4 (tobacco fields in Nambuma) and 6.0 (groundnuts in Chipala). 7.0 is neutral, higher is alkaline and lower is acid. The results indicate acidic soils in all the sites. Tobacco likes relatively acidic soil (5.7-6.0 pH as the ideal), while optimum pH for maize is 5.5-7.0 and groundnuts prefer slightly higher pH at around 6.5-7.0. The soils

16. CEC measures how much nutrients, chemicals and water the soil can hold, and base saturation measures the ratio of K (potassium), Mg (magnesium), Ca (calcium), H (hydrogen) and Na (sodium) to each other and can indicate what amendments may be necessary to balance soil nutrients.

Figure 8: Bulk density (g/cm³)



therefore tend towards the acidic side for food crops. Low organic content and excess nitrogen both can reduce pH, and the main solution is liming to raise pH levels. This increases calcium and magnesium in the soil and improves the uptake of major nutrients (nitrogen, phosphorous, potassium). The soil testing found low levels of ***soil nitrogen*** and ***organic carbon*** content in all sites. A key solution is increasing organic content in the soil.

Total ***base saturation*** is calculated by summing together the levels of calcium, magnesium, potassium, and sodium found in the soil, then expressing this sum as a percentage of the CEC value. For any soil to be considered fertile, it has to have a minimum base saturation value of 50% and above. Base saturation in the three sites ranged from 37.46% (maize in Nambuma) to 48.3% (tobacco in Chipala) indicating that theoretically these soils are not fertile. Application of organic manure is one solution to low base saturation in these fields.

CEC is usually described as the number of hydrogen ions (H+) necessary to fill the soil cation holding sites per 100 grams of dry soil. The CEC of the tested soils is not seen a problem because most values are above the minimum threshold of 15. It should be noted also that even at lower soil depths, still the soils have the CEC value above the minimum value justifying that CEC is not limiting. This implies that these soils have the ability to retain exchangeable cations on exchange sites.

MoAFS acknowledges the weakness of blanket fertiliser application recommendations which are not tailored to the specific context, but say there is no data to make specific fertiliser recommendations[17]. According to John Mussa, a Director in MoAFS, the most limiting nutrient is nitrogen, and there is a need to ensure fertiliser use efficiency including looking for other ways of bringing in N. He indicated a survey conducted by MoAFS revealed a decline in maize productivity after the use of fertilisers.

Soil fertility and household food security

For soil fertility, we can establish the baseline relationship between use of fertiliser (synthetic, animal/green manure) and the same food security proxies as above.

17. Interview, John Mussa, Director: Department of Land Resource Conservation in MoAFS and government representative to the Conservation Agriculture Consortium, Lilongwe, 4 Feb 2014

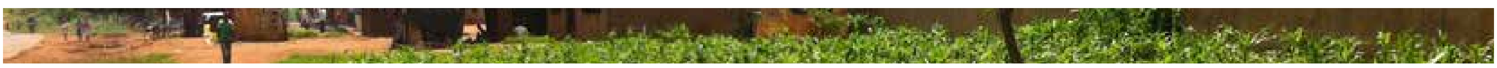


Table 36: Percentage of households using different quantities of fertiliser by dietary diversity (N=91)

Synthetic fertiliser use	Food groups consumed in previous three days		
	3 or fewer	4-7	8+
None	40	20	40
1–100 kg	3.4	20.7	75.8
101–200 kg	0	27.3	72.7
201–300 kg	18.2	0	81.2
>300 kg	0	6.9	93.1

The relationship between the amount of synthetic fertiliser used and dietary diversity shows a trend of households using more synthetic fertiliser also having greater dietary diversity (Table 36). Further evidence of this positive relationship is shown by cross-tabulating synthetic fertiliser use with households' ability to eat what they are used to (Table 37). 70% of those who used no synthetic fertiliser also reported not being able to eat what they are used to, while 55% of those who used more than 300 kg of synthetic fertiliser said they were able to eat what they were used to. This appears to support the GR theory of greater fertiliser use leading to better household food security, but we need to balance for other variables, for example that households that can afford large quantities of fertiliser are already better off. This may well be an indicator of growing class differentiation.

Table 37: Percentage of households using different quantities of synthetic fertiliser by households unable to eat what they are used to (N=91)

Synthetic fertiliser use	HH unable to eat what they are used to in the previous year		
	Often/ always	Sometimes	Seldom/ never
None	70.0	20.0	10.0
1–100 kg	40.7	40.7	18.5
101–200 kg	40.0	30.0	30.0
201–300 kg	30.0	50.0	20.0
>300 kg	6.9	37.9	55.2

Table 38: Percentage of households using manures by households unable to eat what they are used to (N=91)

Manure types	HH unable to eat what they are used to in the previous year		
	Often/ always	Sometimes	Seldom/ never
Animal manure	15.4	43.6	41.0
No animal manure	44.7	31.9	23.4
Green manure	7.7	46.2	46.2
No green manure	35.6	35.6	30.1

Table 38 shows that households that used animal or green manures were more often able to eat what they are used to, while those who did not use animal or green manure were less often able to eat what they are used to.

Table 39: Percentage of households using manures by dietary diversity (N=91)

Manure types	Food groups consumed in previous. three days		
	3 or fewer	4-7	8+
Animal manure	2.4	9.8	87.8
No animal manure	12.2	18.4	69.4
Green manure	7.7	15.4	76.9
No green manure	7.8	14.3	77.9

There is a positive correlation between animal manure use and household dietary diversity, although this could be related to household with access to animals being relatively better off (Table 39). There is no significant difference in dietary diversity between households using green manure and those not using. Overall there are definite positive relationships between both synthetic fertiliser use and animal manure use and improved food security, but we must consider other variables as we proceed, including other variables such as household income, and track this as a potential indicator of nascent class differentiation possibly spurred by GR technologies.

THE FARM INPUT SUBSIDY PROGRAMME (FISP)

Three major government input subsidy programmes from 1998 were combined into FISP in 2005, with focus on providing subsidised maize and legume seed and fertiliser to farmers. FISP resulted in an increase in cereal production, with maize production more than tripling from 2004-2009 and cassava growth doubling, but other crops were stagnant (Chermonics International, 2009:6). FISP appeared to be so successful in increasing yields that Malawi was held up as a GR success story in the mid to late 2000s. However, FISP uses up to 75% of the government's agricultural budget and donors began pushing for an exit strategy, fearing it is not sustainable in long run. The subsidy was withdrawn from tobacco and cotton farmers in 2009, leading to reduction in total expenditure (Chinsinga, 2013). AGRA's position on subsidies is that producer subsidies may carry large deadweight losses and that input subsidies are more effective with favourable agro-ecological conditions for high response cereals, good market access and higher population densities (Chirwa and Dorward, 2013:26). So AGRA is in favour of subsidies, but targeted towards 'high response' crops.

FISP inputs are primarily hybrid seed and synthetic fertiliser. Households benefitting from fertiliser subsidies only have to pay MK 500/50 kg bag (US$ 1.19) with a market value of MK 17,000 (US$ 40.48), although they often do not receive enough and purchase additional bags at full cost. For agro-dealers, FISP operates on a tender system, with one or two outlets getting the contract each year to sell the subsidised inputs. In the 2014 season, ADMARC and SFFRFM were contracted. 44% of participating households indicated they had access to FISP inputs in the past season, with just over half in Chipala and Nambuma but slightly over a third in Chamama (Table 40). There is no statistically significant relationship between access to FISP and land size (Chi square=.412). In FGDs farmers indicated that village headmen with the village development committee (VDC) identified those to get the subsidy, and felt this process was not really fair because only a few people per village can benefit. Farmers indicated this causes tensions within the village and it is difficult to allocate small numbers of coupons. If 8 bags of fertiliser is allocated to a village, this may be mixed and then shared among all farmers, resulting in each household receiving about 5 kg of mixed fertiliser.

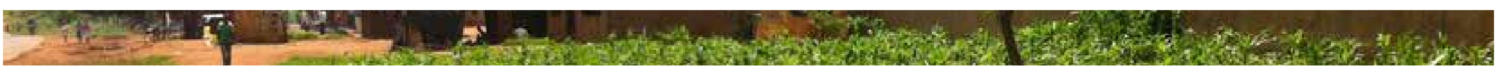
Table 40: Did you have access to subsidised inputs under FISP in the last season?

Area	N	% yes
Chamama	30	36.7
Chipala	30	53.3
Nambuma	30	56.7
Total	90	44.4

In both semi-structured interviews and FGDs, farmers emphasised that farming is increasingly becoming a huge challenge due to high costs of inputs particularly fertiliser and improved seed. In addition to fertiliser and seed, farmers in Chipala also identified general farm implements, pesticides and herbicides. This was not a major issue raised in Chamama. There is evidence in the survey of Chipala being relatively better off than the other two sites. The latter challenges were mostly identified in relation to conservation agriculture that is being promoted as one of the strategies to adapt to the changing climatic patterns.

FISP and seed

It is difficult for most farmers to access improved seed. This is underlined by the fact that as high as 64% of the farmers indicated that they are engaged in seed saving. It is very interesting that most farmers interviewed know that they are not supposed to recycle hybrid maize seed but they nonetheless do. The farmers justified recycling hybrid maize on the account that they are often not sure whether they will have money to buy fresh seed at the time when it will be needed. Most of the farmers argued that they do not want to take chances with the increasingly erratic rainfall patterns. Farmers thus save seed just to be ready in case they rains would come when



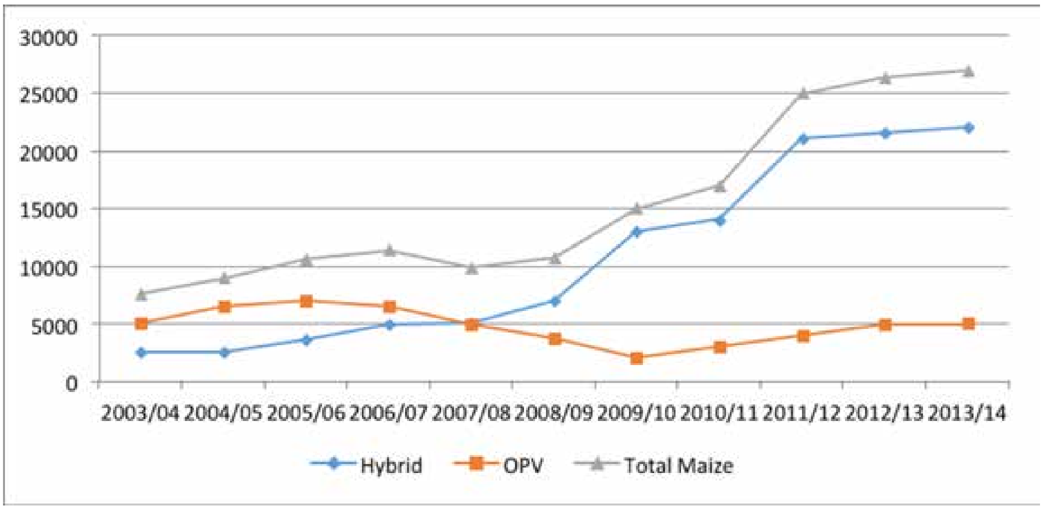
they do not have money to buy fresh seed. Farmers consider it as a very big risk to miss out planting maize with the first rains. They would thus rather plant recycled seed than wait until they have managed to get fresh seed from agro-dealers because it might be too late to enable them to harvest enough.

The survey results do not suggest that FISP plays an important role in providing farmers with access to hybrid seed. The results show that only 10.6% of the farmers accessed hybrid maize through FISP. Only a few farmers accessed bean, groundnut and soya seed through FISP. However, some studies have demonstrated that FISP has greatly contributed to the rise in the proportion of farmers using hybrid maize. Denning, *et al.* (2009) observed that the implementation of FISP contributed to the rise of the proportion of farmers using hybrid maize seed from 43% prior to the implementation of FISP to about 65% in the 2009/10 growing season. Our survey indicates 73% of households used hybrid maize seed in the past season.

Figure 9 shows that the availability of hybrid maize seed has substantially overtaken the availability of OPV maize seed. This development could be explained by the changes in the input support programmes since the turn of the new millennium. FISP succeeded the TIP which provided farmers with OPV maize seed justified as a means of ensuring seed security among farmers since it can be recycled for three consecutive growing seasons without losing its productivity vigour. When FISP was launched in the 2005/06 growing season, the government continued supplying farmers with OPV maize seed but this changed when donors, who had initially boycotted from supporting FISP, started doing so focusing on the seed component from the 2007/2008 growing season. The donors procure the seed from multinational seed companies which deal almost exclusively in hybrid maize. This meant that hybrid maize seed has since the 2007/08 growing season progressively dominated the seed portfolio of FISP hence the apparent increased availability of hybrid maize seed compared to OPV maize seed in the country.

This means that if FISP were to be discontinued it could have serious repercussions on farmers' access to hybrid maize seed. Most farmers indicated that they are unable to access improved seed on their own because it is costly. They have, however, also been unable to access improved seed through FISP.

Figure 9: Availability of improved maize seed in Malawi 2003-2014 in metric tons



Source: STAM, 2014

FISP and fertiliser

Almost every farmer observed that it is difficult for them to access fertiliser because its prices keep on rising year after year yet "the returns from our produce have either stagnated or even deteriorated". This was deemed inevitable since farmers generally lack access to predictable, institutionalised and lucrative markets that can guarantee them decent returns to their efforts. Most farmers indicated that when they are not FISP beneficiaries then it becomes almost impossible for them to access fertiliser. The survey found an average household expenditure of MK 90,000 (US$ 214.29) on synthetic fertiliser. This is more or less the same as the return on 1.5 tons of maize.[18] Of course, that fertiliser also went to producing tobacco, a pure cash crop where some inputs are provided on credit, and where average yields of 700 kg can fetch MK 520,000 (US$ 1,238.10) before deductions and costs. As indicated in the tobacco section above, though, most of this money is absorbed in credit repayments and costs.

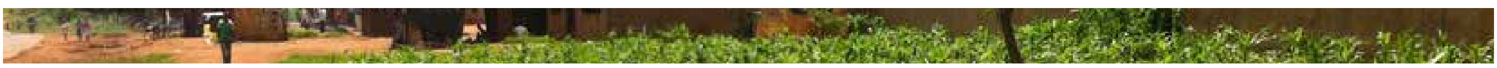
Given the high prices of fertiliser, the alternative for farmers becomes to buy fertiliser in small quantities but they argued that this compromises its efficiency. The consensus among farmers was that lack or limited access to fertiliser greatly undermines the productivity of their farms. This was mainly attributed to the fact that most of the soils are no longer as fertile as they used to be. It is therefore not possible to harvest enough or at all if one does not use fertiliser. Box 3 summarises some of the sentiments of the farmers regarding their ability to access fertiliser.

Box 3: Farmers' sentiments about fertiliser access

- *Fertiliser is difficult for most of us to access because it has become very expensive. Even FISP is not a solution because not everyone including the poorest of the poor are beneficiaries.*
- *We cannot afford fertiliser if we have not benefited from FISP. As a divorced woman, I cannot afford fertiliser at the market value since I am not engaged in any productive activity to raise the money I would need for fertiliser.*
- *With poor prices for our produce, it is not possible for us to get fertiliser at high market prices as well as seed yet these are critical to improving farming.*
- *Fertiliser is no longer affordable for the majority of the people. Those who are able to do so are dependent on tobacco contract farming and without contract farming; agriculture in this area is not simply viable.*
- *Sometimes even if we have a coupon we need to bribe the dealer with MK 2,500–3,000 (US$ 6–7) to gain access.*
- *FISP sometimes brings only one type of fertiliser that is not always appropriate for our needs.*
- *FISP is promoting hatred among the villagers, because some are gaining advantage.*

Farmers consistently linked the challenges in accessing fertiliser and improved seed to the apparent collapse of credit facilities through farmers' clubs. They observed that farmers' clubs are no longer functional to enable farmer access to credit for farm inputs that are adequate and affordable. In talking about these clubs, farmers emphasised that they were referring to farmers' clubs facilitated by MoAFS. In one of the FGDs at Chipala, these farmers' clubs were described as "the most critical level for self-development which can help the majority of the farmers to break free from a vicious cycle of poverty and deprivation that in turn constrain the development of agriculture in the area".

18. 1,500kg x K60/kg in the local market=K90,000



Few people were willing to speak on the record, but there is a clear indication that there are problems with FISP. Comments from farmers, farmer support organisations, extension workers and other key informants included that FISP is politically motivated and that politically it will be a challenge to shift away from the subsidy although technically it can be done; that FISP may increase productivity but is not good for agriculture; that outputs and resources spent do not match; that it is an expensive exercise that does benefit people but not necessarily efficiently; that there are targeting issues and it doesn't reach everyone; that it is controlled by MNCs and government when farmers should be in control of food production; that there is need for graduation out of the system; and that the heavy dependence of the agricultural system on rain can mean input subsidies are a wasted investment if the rains do not come. According to one CNFA-supported agro-dealer we spoke to in Chamama, the bigger companies get the FISP tenders and FISP is killing smaller businesses because they can only compete once the subsidies are finished. A key role for smaller agro-dealers is repackaging seed and fertiliser into smaller units to reach farmers who do not have the resources to purchase large amounts at a time. FISP also works against smaller seed producers because with the voucher system dealers distribute the inputs first and only get paid later. Big companies can afford to carry the costs until payment, but smaller companies cannot afford this.

FISP has been critiqued for expenditure remaining biased in favour of private goods such as fertiliser and seed rather than investments in public goods such as research, rural infrastructure and extension (Chinsinga, 2013:23). Oliver de Schutter, the recent UN Special Rapporteur on the Right to Food, agrees with this and has commented that FISP in Malawi could be scaled down and better ways of realising soil fertility achieved. He calls for a reorientation of the budget to improving extension services among other recommendations (Voice of America, 2013). Despite high yields, most Malawians remain mired in poverty, suggesting that the GR package is not delivering meaningful improvements for farmers. Farmers in FGDs suggested a universal subsidy could be a better approach than targeting subsidies to individual users.

MARKET ACCESS

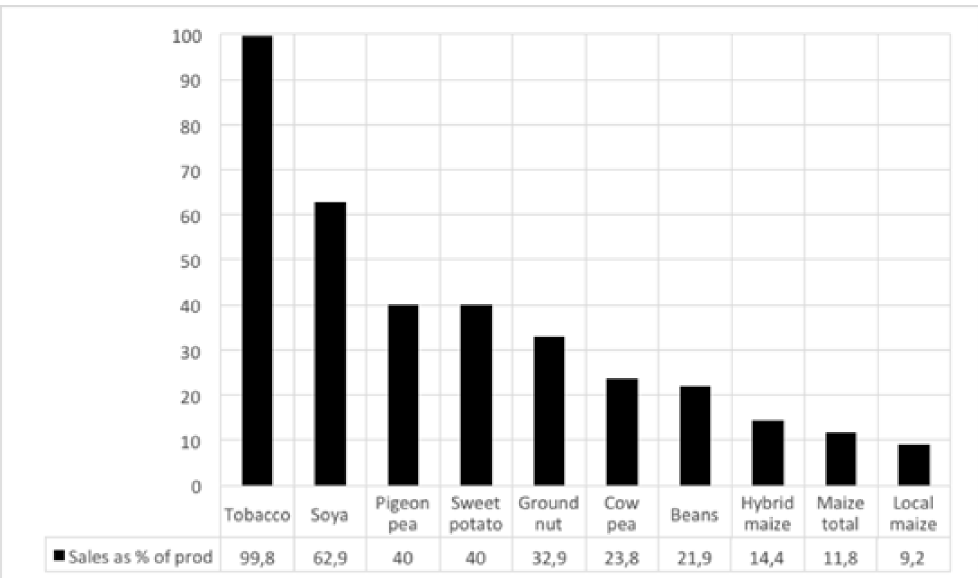
Prior to liberalisation, prices were fixed for specific agricultural commodities and ADMARC was the major buyer. Since liberalisation farmers are now 'free' to choose who they sell to, though their relative bargaining position is very weak. In the survey, 81.6% of farmers cited a lack of markets as being a serious challenge. There were no discernable gender differences. Although marketing was not among the key issues for investigation from the outset, its importance to farmers quickly became apparent. Consequently, a market access focus group was established to dig deeper into the issues. The majority of what follows emerged from this focus group, with some additional inputs from interviews with NASFAM staff.

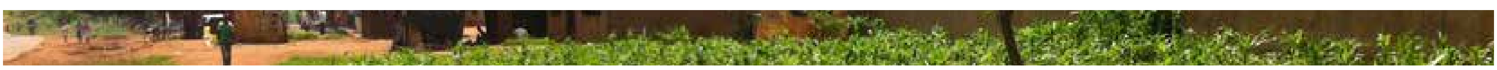
Not surprisingly, tobacco is the major cash crop. Apart from tobacco, soya was the only crop where more than half of production quantity was sold. Average maize sales came to 222 kg, with the vast majority selling under 1 ton of maize and between 62% (hybrid) and 70% (local) of respondents selling 50 kg or less. This may indicate maize as a crop primarily for own use with 'distress' sales of small quantities to get some cash. Hybrid maize was more readily sold than local maize, with an average of 274 kg sold by those who produced hybrid maize compared with an average of just 77 kg sold for local maize. There may be various reasons for this, including preference to retain local over hybrid maize for home use, markets preferring hybrid maize over local maize, and lower local maize yields meaning less available for sale. Figure 10 indicates that local maize was slightly less likely to be sold than hybrid maize, but not by much. For both, sales are low at 9.2% for local maize sales as a percentage of total production and 14.4% for hybrid maize. By-and-large these are not commercial maize farmers, even though they may sell some maize. In three cases more than 1,500 kg of maize was sold, indicating a possible commercialising farmer category.

There were only a few cases of groundnut and soya sales over 1 ton, but the majority of sales for these crops and for beans, pigeon pea, cow pea and sweet potato were less than 500 kg on average. Average sales of these crops ranged from 225 kg for unshelled groundnut to 20 kg for pigeon pea and cow pea.

Apart from sunflower, which was only sold to NASFAM, and tobacco (which is sold at auction), farmers sold these crops to NASFAM, Farmers World and ETG (both private companies) and individual private vendors. There was a general consensus that vendors do not give fair prices when purchasing from farmers; allegations

Figure 10: Sales as a percentage of total production (N=91)





of scale tampering by vendors are common. Unlike the larger private companies, some vendors also travel door to door (offering the same price as they would in a trading centre). They are also usually the first buyers to appear at harvest time. Despite the perceived shortcomings of selling to vendors, come harvest time many farmers are in urgent need of ready cash, so have little other option.

One potential remedy for this is a warehouse receipt system organised by NASFAM in conjunction with Agricultural Commodities Exchange (ACE) and Auction Holdings Ltd. Under the system, currently in its second year, farmers receive a percentage of their commodity (soya, groundnuts and beans so far) upfront in exchange for a warehouse receipt that can be sold at a later date, for example when prices have risen.

In the farmer surveys, large numbers of respondents reported purchasing greens[19] (63.1%) and other vegetables[20] (75%), indicating potential marketing opportunities for these crops. However, the focus group participants (who formed part of a marketing club) had not attempted to collectively market vegetables, citing small markets and low prices offered by the traders who came from Kasungu.

Being a small-scale farmer focused organisation, NASFAM were the preferred choice when marketing crops, for a number of reasons. In terms of pricing, while NASFAM could not offer guaranteed fixed prices, such as those previously offered by state marketing boards, there was agreement that they generally offered the best prices. An example given was for soya, where NASFAM offered around MK 150/kg (US$ 0.36), compared to MK 120–130/kg (US$ 0.29 – 0.31) offered from other buyers. NASFAM is also closer than most other buyers, its organisational structure giving it a presence at the village level. The provision of extension services and information on potential future prices, broken down by location, was cited as another key reason for preference for NASFAM as a buyer.

Opportunities for price premiums based on produce quality presently appear limited. Only ADMARC offered quality premiums, though the organisation's marketing arm is not considered as efficient as it once was and currently purchases more produce from vendors than farmers. Some of the larger companies and NASFAM conduct quality checks on what they purchase from farmers, but, in the words of focus group participants, 'vendors will buy anything'. The idea of a quality price premium was generally a welcome one, with one focus group member saying this would encourage better farming practices.

Farmers raised several concerns with selling off their produce to vendors. First, selling the produce to vendors gives them no opportunity to bargain effectively since the prices are set by vendors. As such, farmers often get low prices for their produce. The low prices are further reinforced by the fact that "the vendors use weighing scales that are tampered with hence we do not get what our produce would have fetched in a normally functioning market". Tampering of scales was reported in more than one site. For most farmers, this makes it very difficult for them to reinvest in agriculture because of the classic 'price-input' squeeze where the prices they get for their produce remain stagnant, while the prices for basic farm inputs, particularly seed and

19. Mustard greens, pumpkin greens, rape, amaranth, green beans, Chinese cabbage
20. Tomato, onion, cabbage, green maize, mushroom, okra pods

fertiliser, keep on rising; yet these are critical to improving farming.

Second, selling farm produce to vendors was widely described as less dignifying but farmers do it anyway because they are often desperate to get some cash to meet some pressing domestic needs. In several FGDs, farmers described trading with vendors as war because "they [vendors] literally snatch the produce from us when we are on our way to town to look for better markets". This makes it difficult for the farmers to engage in a meaningful exchange with the vendors. Farmers have thus to endure exploitative markets since in their engagement with vendors they neither have control over their produce nor the prices at which the produce is sold. Box 4 summarises some of the sentiments of farmers in relation to challenges of accessing institutionalised, predictable and lucrative markets for their produce.

Marketing opportunities are further stymied by post-harvest losses as a result of inadequate storage facilities. Hybrid maize is generally shelled, before being put in bags inside the house. Local maize is not shelled before storage and stored in custom-made granaries (nkhokwe). These are usually constructed from dry reeds and only last 1-2 years. Government efforts in the past have tried to promote granaries made of tin, which can last for 3-4 years and can be made airtight, reducing the need for chemical treatments. For other crops such as groundnuts a small granary is built for storage outside the house, though some focus group members have started storing these inside the house due to theft.

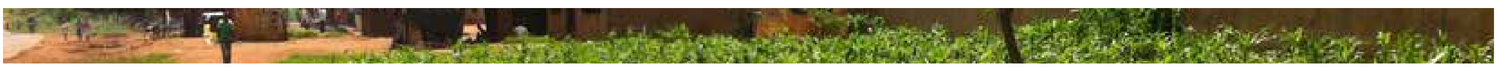
The three main challenges around storage cited in the focus group were aflotoxins[21], rats and ants. Hybrid maize, which generally has a softer flint, is generally more susceptible to aflotoxins than local maize. Focus group members expressed a basic understanding of the risks of aflotoxins, some of whom had received some training on this from NASFAM. Rats are dealt with by a variety of chemicals, with some farmers keeping cats for this purpose. Ants were considered the biggest problem, as chemicals to target them are expensive and not readily available.

Box 4: Farmers' sentiments about markets

- *We do not get decent prices for our produce because markets have been captured by vendors who want to reap where they did not sow.*
- *Vendors literally steal from us. They offer us very poor prices to the extent that we do not profit at all. We continue farming because farming is the only profession where the workers do not go on strike.*
- *Even though vendors do not force us to sell our produce to them, we generally do not have any choice since we are often desperate to get some money to meet pressing domestic needs.*
- *The problem, I stress, is that marketing agricultural produce is very much like some kind of rotary. It is highly unpredictable making farming a very risky venture.*
- *Our main challenge is that we do not have real buyers of farm produce in this country. When we say real buyers of produce we mean institutionalised buyers who offer a predictable market with decent prices that can make farming a worthwhile occupation as it was the case in the days of the functioning ADMARC market system.*

From farmer interviews it was apparent that hybrid maize (but not local maize) is prone to weevil infestations in storage. A variety of preservation methods were described, including smoking maize cobs over a fire and putting the kernels in ash. By far the most common method described was the application of insecticides to the maize kernels.

21. Aflatoxins are mycotoxins produced by two species of Aspergillus, a fungus which is especially found in areas with hot and humid climates. Aflatoxins are known to be genotoxic and carcinogenic and can occur in foods, such as groundnuts, tree nuts, maize, rice, figs and other dried foods, spices and crude vegetable oils, and cocoa beans as a result of fungal contamination before and after harvest. See: http://www.efsa.europa.eu/en/topics/topic/aflatoxins.htm



There is very little in the way of value addition or processing being done in the districts surveyed, leaving the majority of farmers as producers of raw commodities from which value is extracted by other players along the value chain. There was a desire among the focus group participants to buy an oil press to start producing groundnut and sunflower oil, but a lack of capital has held this back. There is clearly potential for this kind of activity; just over two thirds of farmers surveyed reported buying cooking oil or fats within the preceding three days.

Marketing produce as a club has strengthened the relative bargaining power of farmers when selling their produce to NASFAM, but appears to make little difference when selling to other buyers, such as individual vendors. Pooling resources into value-adding activities is another potential area of benefit from club membership. Although NASFAM's office manager in Kasungu cited a number of examples of this from around the country, including soya, sunflower and chilli pepper processing, we did not find significant farmer-managed value addition in the three areas of the present study.

The main concern of the farmers is that they lack institutionalised and predictable markets where they can sell their produce at a profit. There are some existing markets such as the tobacco companies who provide and organise a market for produce; NASFAM for some crops with their members, and the increasingly erratic ADMARC. Outside these markets, the only alternative is to sell off their produce to vendors.

Farmers recognise and acknowledge the efforts that have been taken by some organisations such as NASFAM to provide somewhat institutionalised markets for their produce. While these efforts have tremendously helped farmers to dispose of their produce at fairly decent prices, they strongly feel that there is still considerable room for improvement. Meanwhile the concerns of framers are essentially twofold. First, farmers are concerned that these organised market initiatives often kick in rather late, and because of pressing livelihood needs, the majority of the farmers end up selling off their produce to vendors at very low prices. Second, farmers are concerned that most of these organised market initiatives are credit driven. In this regard, farmers observed that these markets are disbanded as soon as the organisers have bought enough produce that can help them recover the loans that were given out to farmers. In other words, one of the farmers observed that "these markets operate as long as the farmers have not finished repaying their loans and disappear almost immediately afterwards".

CONCLUSION AND FURTHER RESEARCH

Green Revolution interventions, of which AGRA is a leading example, are fundamentally premised on the idea that increased costs of certified seed and synthetic fertiliser can be met by increasing yields, which will allow for increased sales that can generate income for input purchase in the next year as well as expansion of farming as a business to the benefit of producers. However this 'endless virtuous cycle' does not appear to have taken root in Malawi. Farming households are purchasing some GR inputs but realising potential yields require ideal conditions and these are present nowhere in Malawi. Whether the limiting factors are lack of rainfall, weak soils, lack of appropriate production support, chronic ill-health, lack of access to clean water or other factors, GR technologies will always perform sub-optimally. This means yields will be lower than potential yields in ideal circumstances. This means households must use a greater share of their produce for own consumption. This means less available for sale and thus lower incomes than anticipated in the GR theory.

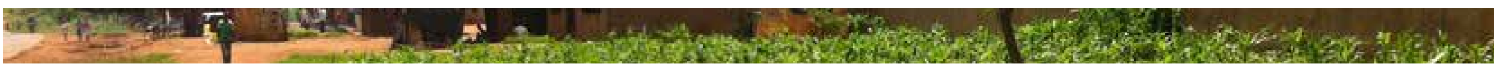
This is borne out in the research, where the vast majority of households appear to be caught in a relationship of dependency on GR inputs, in particular synthetic fertiliser. It is apparent that fertiliser and seed prices are very high and are a major concern for farming households. At the same time, these households feel the necessity of using these inputs just to stay in the same place. There may be some yield increases especially in maize, but the maintenance of these yields requires a continual reliance and expansion of external inputs at a long-term ecological cost. Instead of a virtuous cycle of increasing prosperity for farmers, we see a negative cycle based on short-term yield improvements, creating a dependency in these inputs while generating long-term yield stagnation and declining soil fertility, which reinforce dependency on GR technologies that contributed to the problem in the first place.

Malawi has been hailed as a GR success story. But a closer look reveals farmers trapped in a cycle of debt and dependency on costly external inputs, and an eroding natural resource base. Small-scale farmers are using shocking high levels of synthetic fertiliser at great financial cost to themselves and the government, and rising soil infertility. Farmers are increasingly adopting hybrid maize seed, encouraged by government subsidies and the promise of massive yield increases. However, the adoption of these hybrid seeds comes at the cost of abandoning the diversity and resilience of local varieties, and the ever-escalating requirement for synthetic fertiliser applications. Given structurally low product prices, the slight yield increases being realised by farmers seldom justify the added financial and ecological expense of the inputs. Indeed, findings show net transfers away from farming households to agribusinesses through the adoption of GR technologies.

Even if maize yields are higher using GR technologies, the diversity of nutrition and the all-year production of agro-ecological systems give the latter much greater depth. Malawi has a regular hungry season despite productivity increases in maize. This is related to the production and harvest of a single crop every year[22]. Support for crop diversification and diversified year round production can extend the range of nutrients available to farming households.

Tobacco company value chain financing and FISP are key mechanisms for propping up this system of production. In the tobacco value chain primary producers are reliant on tobacco production as a cash crop. But they are clearly in a weak position, relying on buyers to provide inputs, while the producers carry the production risk and receive only a small portion of value added. Tobacco multinationals are the primary beneficiaries of this system. The MNCs are politically very powerful and the Malawian government is reliant on the industry for a large portion of foreign exchange. However, tobacco as a crop is poisonous, it damages the soil, contributes to deforestation which in

22. Interview, Kristof Nordin, Never Ending Farms, Lilongwe, 5 Feb 2014



turn leads to soil degradation and increasing CO_2 emissions, and locks farmers into production systems that are not in their long term interests. In essence tobacco is an anti-social crop, and Malawi and other producing countries in the region should consider socially and ecologically just alternative crops and production systems to replace tobacco.

FISP is an essential element in the expansion of GR technologies in Malawi. The programme has increased effective demand for hybrid maize seed and synthetic fertiliser, and created a guaranteed market for MNCs to profit in. These include some of the biggest input multinationals such as Monsanto, Pannar Seed (now owned by Pioneer Hi-Bred) and Yara. FISP has increased the amount of money circulating in and out of the farming system, but farmers are in a worse position than they were. Mostly the gains are limited to relatively minor yield increases, with a net transfer of financial resources away from farmers and long-term negative consequences on the ecology. To make matters worse, the money comes in from public expenditure through the subsidies (development aid as well as African governments) and out through private channels (seed and fertiliser companies). This is essentially public investment for corporate gain, with seed and fertiliser multinationals the primary beneficiaries of this system.

Although GR technologies are making inroads into small-scale farming systems in Malawi with public support and support from philanthropic institutions including AGRA, farming households are engaged in a range of agro-ecological practices that form the material basis within which the GR embeds itself. CA and ISFM are good examples of this, where a base of agro-ecological practice is used to advance GR technologies. The research indicates agro-ecological practices are widespread and this offers an opportunity for systematic support to realise a more sustainable and equitable path of agricultural development.

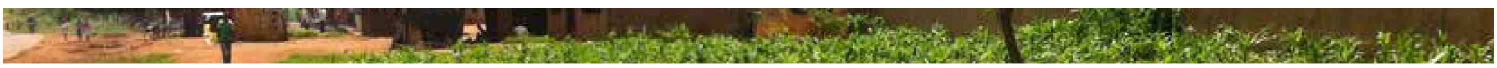
Fertiliser currently is allocated without even knowing what soil nutrient needs are. There are high levels of synthetic fertiliser use and farmers are caught on a treadmill of dependency. The best path is a gradual weaning away, with evidence that other methods can be effective. Even GR proponents recognise the critical importance of adding organic content to the soil as a fundamental basis for improving fertility, yet they are unwilling to invest in enhancing and expanding these practices.

In agreement with Olivier de Schutter, we propose that input subsidies targeted at individuals should be phased out and replaced with public investment in extension, farmer-based R&D and bulk infrastructure such as water and roads with collective benefit. A key part of public investments in R&D and extension can include identifying, prioritising and supporting work around participatory plant breeding, participatory variety selection, farmer-managed seed certification and quality assurance systems, identifying and supporting development of locally important crops on the basis of decentralised participatory R&D, farmer to farmer exchanges, identifying and expanding means of increasing organic content in the soil, an orientation to nurturing soil life as the basis of soil fertility or soil health programmes, and support agro-ecological methods of soil improvement and water retention. Work on nitrogen fixing trees and food trees could advance soil fertility and food security agendas.

The research has shown that while AGRA programmes are having a relatively small impact in the sites we looked at, AGRA is contributing significantly to the broader GR thrust. Follow up research will focus in more detail on NASFAM's pigeon pea programme, on the CNFA supported agro-dealer networks and on monitoring and analysing the interventions of the SSTP and on AGRA's other seed work in the country as a whole.

APPENDIX 1: AGRA PASS and SHP grants in Malawi, 2007-2015

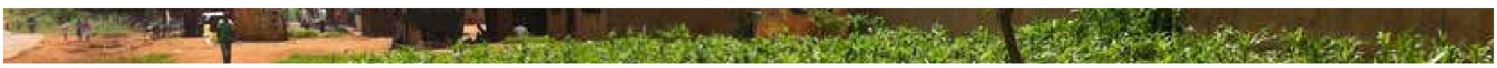
Grantee name	Grant number	Program area	Grant purpose	Start date	End date	Grant amount
PROGRAM FOR AFRICA'S SEED SYSTEMS						
ASSMAG	2008 PASS 056	SEPA	To enable smallholder farmers in Malawi increase their productivity, food security and household incomes through use of improved seeds at affordable costs and from nearby sources	01/11/2008	30/04/2011	$163,450
CPM AGRI Enterprises	2011 PASS 002	SEPA	To improve food security and reduce poverty among rural and poor smallholder farmers in Malawi through production and dissemination of quality seeds of maize, beans, soybean, peas and groundnuts	01/07/2011	30/06/2013	$150,000
Funwe Farm Limited	2007 PASS 037	SEPA	To produce, promote and distribute hybrid seed for use by poor smallholder farmers in under-served areas of Malawi.	01/11/2007	30/06/2012	$138,073
Ministry of Agriculture & Food Security	2009 PASS 035	SEPA	To avail improved cassava and sweet potato planting materials to smallholder farmers in Malawi for increased food security and household incomes	01/02/2010	31/01/2013	$137,000
Enock Kuziwa Maereka	2009 PASS C006	SEPA	To further strengthen the capacities of three grantees: Funwe Farm Ltd and Seed - Tech Company particularly on seed production and processing, over a period of five months. The objective is for the consultant to work on a daily basis during the main planting season, with the seed company's technical people so as to impart practical skills.	15/09/2009	14/03/2010	$26,625
Enock Kuziwa Maereka	2011 PASS C005	SEPA	To further strengthen the capacities of CPM AGRI Enterprises particularly on seed production and processing, over a period of six months.	15/10/2011	14/04/2012	$46,375
Itai Makanda	2010 PASS C005	SEPA	To further strengthen the capacity of ASSMAG particularly on seed production and processing, over a period of six months. The objective is for the consultant to work on a daily basis during the main planting season, with the Association's technical staff so as to impart practical skills.	20/11/2010	19/05/2011	$0
Seed-Tech Company	2007 PASS 038	SEPA	To produce, promote and distribute improved seed varieties for use by poor smallholder farmers in Malawi.	01/11/2007	31/10/2009	$150,000



Grantee name	Grant number	Program area	Grant purpose	Start date	End date	Grant amount
Ministry of Agriculture & Food Security	2009 PASS 029	Fund for the Improvement and Adoption of African Crops (FIAAC)	To sustain self-sufficiency in maize production, lower seed cost and improve food security among smallholder farmers in Malawi through development of high yielding, disease and pest resistant maize varieties for the mid-altitude areas of Malawi.	01/02/2010	31/01/2013	$184,250
Ministry of Agriculture & Food Security	2007 PASS 002	FIAAC	To develop improved cassava varieties with high yield potential, disease resistance, and good adaptation to Malawian farming conditions.	01/03/2007	30/06/2010	$184,470
Ministry of Agriculture & Food Security	2008 PASS 047	FIAAC	To enhance farmers' livelihoods and improve food security in Malawi by developing new improved bean varieties with bruchid resistance, high yield potential and farmer preferred traits	01/09/2008	31/08/2011	$177,320
Ministry of Agriculture & Food Security	2009 PASS 017	FIAAC	To improve food security, nutrition and incomes among smallholder farm families in Malawi through the development, release and promotion of adapted early maturing sweet potato varieties that are tolerant to weevil damage, have good storability and high beta-carotene content.	01/12/2009	30/11/2012	$183,900
Ministry of Agriculture & Food Security	2009 PASS 029	FIAAC	To sustain self-sufficiency in maize production, lower seed cost and improve food security among smallholder farmers in Malawi through development of high yielding, disease and pest resistant maize varieties for the mid-altitude areas of Malawi.	01/02/2010	31/01/2013	$184,250
Ministry of Agriculture & Food Security	2010 PASS 035	FIAAC	To improve food security and livelihoods among smallholder farmers in Malawi by developing sweet cassava varieties that have multiple uses along the value chain; direct consumption as a snack or boiled, animal feed, and processing for starch and other products	01/01/2011	31/12/2013	$150,000
Ministry of Agriculture & Food Security	2011 PASS 046	FIAAC	To improve food security and livelihoods of smallholder farmers in Malawi through breeding rainfed rice varieties for high yield, stress tolerance and quality	01/05/2012	30/04/2015	$178,350
CNFA	2007 PASS 021	Agro-Dealer Development Program (ADP)	To develop national agro-dealer networks to improve access to agricultural inputs by farmers in Malawi.	01/06/2007	30/11/2010	$4,275,965

Grantee name	Grant number	Program area	Grant purpose	Start date	End date	Grant amount
RUMARK	2011 PASS 019	ADP	To improve agricultural productivity among smallholder farmers in Central Malawi through the development of a strong, sustainable network of agro-dealers that will avail agricultural inputs cost effectively, thereby contributing to increased household incomes and reduced poverty levels	01/11/2011	31/10/2013	$350,000
University of Malawi	2009 PASS 024	Education for African Crop Improvement (EACI)	For use by Bunda College of Agriculture to better address the crop improvement needs of smallholder farm families in the SADC region by building human capacity in plant breeding and agronomy at M.Sc. level in order to provide a critical mass of scientists and researchers working in crop improvement	01/02/2010	31/01/2012	$376,825
University of Malawi	2011 PASS 051	EACI	To contribute to the improvement of the seed systems and smallholder farmer crop yields in Malawi and Mozambique by training 10 students at MSc level in plant breeding, agronomy and seed production at Bunda College of Agriculture of the University of Malawi	01/05/2012	31/10/2014	$346,815
SOIL HEALTH PROGRAM (SHP)						
Ministry of Agriculture & Food Security	2011 SHP 009	Soil Health Research	To increase food and nutrition security for smallholder farmers in Malawi through improved fertiliser recommendations and, increased fertiliser use	01/08/2011	31/07/2014	$425,069
NASFAM	2009 SHP 032	Soil Health Extension	To improve food security and incomes of smallholder farmers through improving soil fertility by integrating pigeon peas in maize production systems in Malawi	01/01/2010	31/12/2012	$950,400
William J. Clinton Foundation	2009 SHP 021	Soil Health Extension	For use by Clinton-Hunter Development Initiative (CHDI) Malawi, to improve food security, incomes of smallholder farmers in Malawi as a result of improved soil fertility achieved through soybean-maize rotations and better access to markets	01/03/2010	28/02/2013	$719,638
University of Malawi	2010 SHP 001	Soil Health Training	To produce well trained human resources equipped with practical skills in integrated soil fertility management practices that can contribute to improving smallholder agricultural productivity and food insecurity	01/08/2010	31/07/2013	$365,697

Source: AGRA grants database, www.agra.org – accessed 12 August 2014



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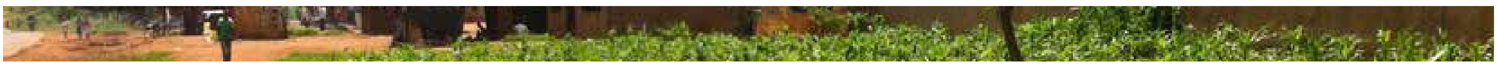

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