

# Which way forward for Zambia's smallholder farmers:

Green Revolution input  
subsidies or agro-ecology?

October 2015



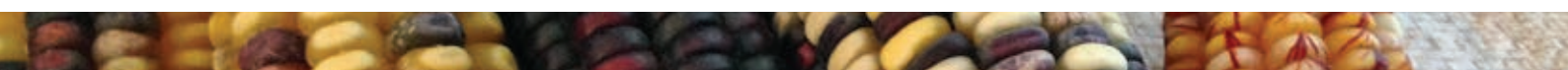
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On 07 April 2015 the African Centre for Biosafety officially changed its name to the African Centre for Biodiversity (ACB). This name change was agreed by consultation within the ACB to reflect the expanded scope of our work over the past few years. All ACB publications prior to this date will remain under our old name of African Centre for Biosafety and should continue to be referenced as such.

We remain committed to dismantling inequalities in the food and agriculture system in Africa and our belief in peoples' right to healthy and culturally appropriate food, produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems.

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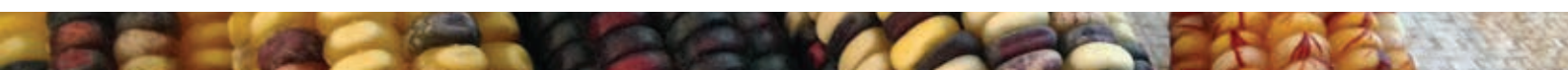
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## ACRONYMS

ACB	African Centre for Biodiversity
ADP	Agro-dealer Development Program
AFAP	African Fertiliser and Agribusiness Partnership
AfDB	African Development Bank
Ag SAG	Agricultural Sector Advisory Group
AGOA	African Growth and Opportunity Act
AGRA	Alliance for a Green Revolution in Africa
APPSA	Agricultural Productivity Program for Southern Africa
ARIPO	African Regional Intellectual Property Organisation
BCN	Biodiversity Community Network
CA	Conservation agriculture
CAADP	Comprehensive African Agriculture Development Programme
CARE	Cooperative for Assistance and Relief Everywhere
CCARDESA	Centre for Coordination of Agricultural Research and Development for Southern Africa
CDT	Cotton Development Trust
CFU	Conservation Farming Unit
CGIAR	Consultative Group for International Agricultural Research
CGRFA	Commission on Genetic Resources for Food and Agriculture
CIMMYT	International Maize and Wheat Improvement Center
COMESA	Common Market for Eastern and Southern Africa
CSA	Climate smart agriculture
CSO	Civil society organisation
CTDT	Community Technology Development Trust
DAI	Development Alternatives Incorporated
DfID	Department for International Development (United Kingdom)
DUS	Distinct, uniform and stable
EAC	East African Community
EACI	European Association for Creativity and Innovation
ETG	Export Trading Group
EU	European Union
FAO	Food and Agriculture Organisation
FBA	Farmer business advisor
FIAAC	Fund for the Improvement and Adoption of African Crops
FIRCOP	Fund for Innovative and Collaborative Research Projects
FISP	Farmer Input Supply Programme
FO	Farmer organisation
FRA	Food Reserve Agency
FSO	Farmer support organisation
FSP	Fertiliser Support Programme (2002-2008)
FTA	Free Trade Area



FtF	Feed the Future
GART	Golden Valley Agricultural Research Trust
GDP	Gross domestic product
GM	Genetically modified
GMO	Genetically modified organism
GNI	Gross national income
HIPC	Highly Indebted Poor Country
HRNS	Hanns R. Neumann Stiftung
IDE	International Development Enterprises
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFDC	International Fertiliser Development Centre
IFPRI	International Food Policy Research Institute
IIRR	International Institute of Rural Reconstruction
IITA	International Institute for Tropical Agriculture
IMF	International Monetary Fund
IP	Intellectual property
IPNI	International Plant Nutrition Institute
IPRs	Intellectual property rights
ISFM	Integrated soil fertility management
ISSD	Integrated Seed Sector Development
ISTA	International Seed Testing Association
ITPGRA	International Treaty on Plant Genetic Resources for Agriculture
JICA	Japanese International Cooperation Agency
KATC	Kasisi Agricultural Training Centre
km	Kilometre/s
MACO	Ministry of Agriculture and Cooperatives
MAL	Ministry of Agriculture and Livestock
MNC	Multinational corporation
MOU	Memorandum of understanding
MRI	Maize Research Institute
NAFSN	G8's New Alliance for Food Security and Nutrition
NAP	National Agriculture Policy
NAIP	National Agriculture Investment Plan
NAT	Nutri-Aid Trust
NGO	Non-governmental organisation
OECD	Organisation for Economic Cooperation and Development
OPV	Open pollinated variety
PAFID	Participatory Approaches for Integrated Development
PASS	Program for Africa's Seed Systems
PBRs	Plant breeders' rights
PPP	Public-private partnership
PROFIT+	Production, Finance and Improved Technology Plus
PVP	Plant variety protection



QDS	Quality declared seed
R&D	Research and development
RWA	Rural Women's Association
SADC	Southern African Development Community
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SANSOR	South African National Seed Association
SAP	Structural adjustment programme
SATH	Southern African Trade Hub
SCCI	Seed Control and Certification Institute
SCRB	Soil and Crops Research Branch
SDC	Swiss Agency for Development and Cooperation
SEPA	Seed Production for Africa
SHP	Soil Health Program
SMTA	Standard Materials Transfer Agreement
SNV	Netherlands Development Organisation
SUN	Scaling Up Nutrition
SWMD	Soil and Water Management Division
UK	United Kingdom
UKAID	United Kingdom Agency for International Development (formerly Department of International Development – DfID)
UNICEF	United Nations Children's Fund
US	United States
USAID	United States Agency for International Development
UNZA	University of Zambia
WFP	World Food Programme
WIN	Wealth Creation through Irrigation
WTO	World Trade Organisation
ZAABC	Zambia Alliance for Agro-ecology and Biodiversity Conservation
ZARI	Zambian Agricultural Research Institute
ZMK	Zambian kwacha
ZNFU	Zambian National Farmers' Union
ZSHC	Zambia Soil Health Consortium

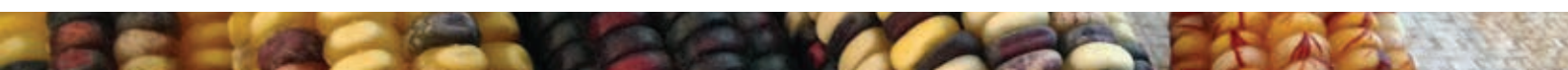




Figure 1: Map of Zambia with main towns



## EXECUTIVE SUMMARY

### Introduction

The research is part of a three year multi-country programme looking at the impacts of the Green Revolution on small-scale farmers in southern Africa, with a particular focus on seed and soil fertility. We started with a focus on the interventions and activities of the Alliance for a Green Revolution in Africa (AGRA). In the course of the research in Malawi and Tanzania we noted that AGRA is just one component of a much larger Green Revolution agenda; and consequently we have widened our scope to try to get a broader picture of coordinated Green Revolution activities.

AGRA operates in Zambia but its activities are not as geographically focused as they are in Tanzania and Mozambique, because Zambia is not an AGRA breadbasket country. We opted to investigate Green Revolution activities as well

as looking at the alternative agro-ecological activities of members of the Zambia Alliance for Agroecology and Biodiversity Conservation. This report is an initial scoping study.

### Background to land and agriculture

The agricultural sector contributes around 13% to Zambia's gross domestic product (GDP) with a distinct downward trend over the past 15 years, typical of an urbanising economy. However, agriculture remains very important for the majority whose daily survival depends on agriculture.

Zambia is divided into three broad agro-ecological zones. The southern and eastern parts of the country are drier and predominantly planted to drought-tolerant crops such as sesame, sorghum and millet, with extensive cattle grazing. Maize, irrigated wheat, groundnuts, millet, sunflowers, tobacco, cotton, rice and other crops are planted in the central areas which, with their higher rainfall, are the

most agriculturally productive areas. The north of the country receives higher rainfall and has typically acidic soils. This region is planted to millet, cassava, sorghum, beans, coffee, sugar cane, rice, pineapples and bananas, amongst others.

There are widely divergent estimates of the amount of land available for agriculture. The World Bank says that forests cover about 56% of the land area; agricultural land constitutes about 25.6m ha; that around 80% of agricultural land is permanent pasture; and the remainder (around 5.3m ha) is arable land. However, the 2011 National Agriculture Policy (NAP) indicates that around 42m ha has medium to high crop production potential. So it is difficult to say how much land is actually available for agriculture.

All land is held in trust by the state; 94% is designated customary land, with access and use controlled by chiefs and village headmen; and the remainder is deemed statutory tenure with accompanying formal registration and title rights (renewable 99-year lease). Since the enactment of the 1995 Lands Act, which allows for conversion of customary land to leasehold, some customary land has been converted for investment purposes. About a decade ago roughly three quarters of Zambia's farmers were considered small-scale (<10 ha); 24% were considered emergent and medium-scale farmers (10–60 ha) and 1% were regarded as large commercial farms (>60 ha). Among the small-scale farmers around 70% cultivated less than 2 ha of land.

Land access is an issue for many small-scale farmers; an estimated 56% believe there is limited land available for farming, as traditional leaders have already allocated most of the land in and around their villages. Government strategy is a combination of the gradual consolidation of smaller parcels of land into slightly bigger units, and the allocation of large blocks of land for commercial agriculture, with some outgrowers. The state has allocated around 1m ha of customary land to the development of farm blocks of 100,000 ha or above. At least one block is allocated in each of the provinces. The plan is to have one core commercial venture on 10,000 ha, one to three commercial farmers on 1,000–5,000 ha each,

and medium-scale, emergent and small-scale farmers working on smaller areas in outgrower schemes. The focus is on high-value crops for export.

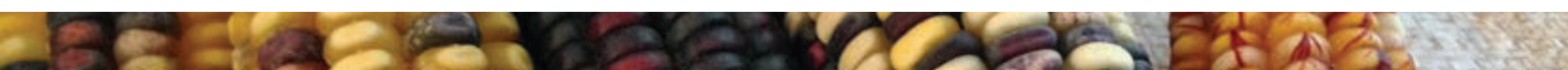
The main crops by area harvested in 2014 were maize (52% of the area of the top 8 crops), followed a long way behind by cassava (11%), groundnuts (11%) and seed cotton (9%). Major export crops are tobacco, cotton, tea and coffee, with cut flowers as a growth area. The main staple crops are maize, cassava, sorghum and pearl millet. As with other countries in the region, maize dominates production. Maize is referred to as a 'politicised crop' because of government interventions. Recent years have seen bumper harvests as a result of Green Revolution technologies and the input subsidy scheme, but there are market and storage challenges.

Small-scale farmers, as elsewhere on the continent, produce primarily for household use with surpluses sold or exchanged locally. Maize for sale is usually managed by men, while women are responsible for legumes and vegetable production, mainly for household use. An estimated 2% of farmers produce 50% of marketed maize, and 60% of farmers in an average year are hungry for several months.

Livestock comprises mainly cattle (beef and dairy), with some poultry, pigs, sheep, goats and other small ruminants. More than 80% of Zambia's herd is under traditional (non-commercial) management. Approximately a decade ago per capita meat consumption in Zambia was about half Africa's average consumption, and it remains lower than the regional average.

## The Green Revolution in Zambia

Zambia liberalised the agricultural input market in 1991 following the imposition of a structural adjustment programme by the International Monetary Fund (IMF) and the World Bank. The government signed a Comprehensive African Agricultural Development Programme (CAADP) Compact in 2011 and aligned domestic policy and plans (the National Agricultural Plan and National Agricultural Investment Plan) to the Compact. These plans offer a typical Green





Revolution policy framework: productivity, input and output markets, public and private institutional capacity, and access to productive resources for small-scale farmers. They aim to realise a predictable and stable environment for agribusiness production and commercialisation, and are private sector driven but provide for a government role to create an enabling environment. These plans were adopted in the context of the harmonisation of regional and global policies that reduce the room in which governments can manoeuvre.

Long term programmes of regional economic integration are coming to fruition, albeit unevenly. An example of this is the regional development corridors. Lusaka finds itself as a regional hub for agricultural corridors in southern Africa, and is the start and end point of no fewer than four regional corridors: the North-South Corridor through Zimbabwe and Botswana to South Africa (Durban via Gauteng); the Beira and Nacala Corridors to Mozambique; and the Dar es Salaam Corridor through the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). Zambia is landlocked and its shortest route to the sea is through the Beira and Nacala Corridors in Mozambique.

The corridors are blueprints for public-private investments over 20 year time spans, but are heavily dependent on mining and other energy investments in transport and communications infrastructure—in particular before the agricultural component kicks in. Mostly they are a combination of different strategies, with some large-scale commercial projects for export markets coupled with interventions to commercialise small-scale agriculture; the latter can take advantage of infrastructure to reach commercial markets in urban areas and for export. Small-scale farmer investments focus on irrigation, Green Revolution ‘improved’ seed and synthetic fertiliser technologies, financing, securing output markets and other familiar Green Revolution interventions. A Green Revolution commercial agriculture approach generally favours a relatively small elite group of farmers who are in a position to take advantage of the opportunities provided by these interventions. Recent studies indicate that development corridors can benefit only

2–10% of smallholders at best, and to date the corridors have favoured the interests of multinational private sector and domestic elites.

### **The Farm Input Subsidy Programme (FISP) and the Food Reserve Agency (FRA)**

Agriculture spending as a portion of the national budget increased from 12.2% in 2007 to 13.6% in 2011, but 80% of this was spent on input subsidies (fertiliser and seed) through the Farm Input Supply Programme (FISP) and the procurement of maize through the Food Reserve Agency (FRA).

Input subsidies have been part of Zambia’s landscape since independence. However, in the 1990s, with structural adjustment, these programmes were curbed for some time and one of the results was a decline in maize production. In the early 2000s government decided to reinstate subsidies for fertiliser and hybrid maize seed. In 2009 the programme was updated and became the FISP. Subsidies rose from 50% on fertiliser and seed in 2002, to 79% on fertiliser and 53% on seed, in 2011/12. There was a sharp increase in average annual maize production following the launch of the input subsidy programme, from an average of 1m tons in the 1990s to 1.2m tons in the 2000s, and 2.9m tons from 2010–2014. While an increase in production may be welcome, there are costs to this exclusive focus on a single crop. It directs farming households towards maize production even in marginal conditions, thus reducing ecological sustainability and ultimately production diversity. It also has negative implications for production diversity and hence the diversity of nutrients available in food.

Until 2011 the allocation of Zambia’s agricultural budget to FISP fluctuated between 10% and 43%. After 2011 the FISP budget was reduced and by 2013 it had fallen to around 23% of the agricultural budget. As in other countries, suppliers are determined through a competitive tender process. Omnia Fertiliser Zambia Ltd and Nyiombo Investments Ltd were awarded the contract every year, up to 2013. In 2013 the Zambian Competition Commission fined the two companies for bid-rigging and cartelistic practices in relation to FISP and



barred them from supplying fertiliser to the programme in the future. Subsequently five companies—Ultratek, Zambian Fertiliser, Neria Investments, and two South African companies, Foskor and Bosveld Phosphates, were awarded tenders to supply raw materials for the programme. However, reports indicated significant political interference even after the tenders were awarded. Recent shifts aim to include agro-dealers as delivery agents in the contract process.

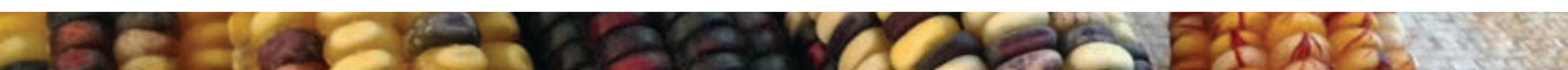
The 2009 shift to FISP also expanded the range of crops subsidised; whereas previously only maize had been subsidised, the programme was amplified to include rice, sorghum and groundnuts. Efforts at diversification are a step towards responding to one of the main criticisms of FISP—that it has focused almost exclusively on maize. A number of other censures have been levelled at the programme, including the following: questions about whether the cost of the programme justifies the outcomes; the beneficiary criteria—which may exclude a large number of poorer farming households that cannot plant 1 ha of maize or cannot afford membership fees to farmers' groups or cooperatives; in practice the programme tends to benefit better-off farming households; that not all farmers receive the full input package; and the standard problem of the late delivery of inputs. Proposals for reform include suggestions that subsidies to FISP might be better utilised on the known pro-poor drivers of agricultural growth, such as research and development (R&D), extension services, rural roads and infrastructure, electrification and rural health and education.

As we have found elsewhere in the region, the flipside of the agricultural input markets that drive the Green Revolution is the expansion of output markets to absorb increased production of more standardised products. Theoretically these also generate the cash to purchase new inputs for the next season. Government has prioritised the development of output markets, including the establishment of institutions, financing arrangements, physical infrastructure, farmer support and even guaranteed markets, such as FRA grain purchases.

The government's FRA is a key market for smallholder surpluses, especially regarding maize. Its essential functions are to maintain a national strategic food reserve; to engage in the marketing and trading of designated agricultural commodities, including establishing or setting prices where private sector involvement is minimal; and managing national storage facilities. The FRA has purchased an increasing amount of maize from smallholders, which accounted for an estimated 83% of smallholder sales in 2010/11. It absorbs a significant amount of public resources, evidenced by an average 25% of government's total allocation to poverty reduction programmes between 2004 and 2011.

Assessing the FRA is a challenging question. On the one hand it is positive for government to support farmers by assisting in buying their surpluses at higher prices than prevailing market prices, and to have a strategic reserve for use when necessary that enables people to acquire the food they need to survive. On the other hand there are questions about where support is directed, who benefits, and how the programme builds strength and resilience within the farmer base. The intervention is very much built around maize, in classic African Green Revolution style, but the narrow marketing focus on maize is detrimental. It compels farmers into a maize dependency trap, a practice that is closely related to the Green Revolution in its most crude and extractive form. Food reserves that cater only for maize will provide calories but not the necessary nutrients. Ideally a food reserve should contain a diversity of food products. This requires the production of harvests other than maize alone, and the decentralisation of storage and management.

Major donors to Zambian agriculture include the United States Agency for International Development (USAID), AGRA and the World Bank, United Nations institutions including the Food and Agriculture Organisation (FAO) and the International Fund for Agricultural Development (IFAD), as well as the Scandinavian countries (Finland, Norway and Sweden in particular). There is also some Chinese investment.



**USAID's** Zambian projects concentrate on the agricultural sector, health issues, HIV/AIDS awareness and treatment, basic education and democratic governance. USAID supports the implementation of the CAADP Compact to create an enabling environment for private sector investment, and focuses on addressing policy and regulatory issues related to agriculture and natural resource management; identifying trade opportunities, issues and constraints; and developing a supportive policy and regulatory environment for agriculture. USAID's Feed the Future programmes are concentrated in the Lusaka-Eastern Province corridor which links to the Nacala Corridor in Mozambique, via Lilongwe in Malawi.

**AGRA** disbursed 24 grants in Zambia at a total cost of US\$ 12.37m between 2007 and 2014. Until 2012 AGRA's Program for Africa's Seed Systems (PASS) had been allocated around 61% of the total value of grants in Zambia; this was followed by the Soil Health Program (SHP) (at 22%) and then other grants (PPP Investments and Markets) (at 17%). The Agro-dealer Development Program (ADP) received the largest share of the PASS grants (63%), with the majority of this going to the Cooperative for Assistance and Relief Everywhere (CARE) between 2008 and 2011, to extend an agro-dealer network. Government institutions—the Zambian Agricultural Research Institute (ZARI) and the Seed Control and Certification Institute (SCCI)—and the University of Zambia (UNZA) received 20% of PASS grants by value.

### **Agrodealers, extension services, and the transfer of technology**

A critical aspect of input supply is delivery channels. Developing new technologies are of little use if they cannot be transferred to farmers. Historically, delivery and advice was conducted by the public sector extension service, but this facility was denuded with structural adjustment and the consequent neglect of investment in agriculture. Although public extension services continue to play a role, the model of technology dissemination and advice favoured by Green Revolution methodology is private enterprise with support for the establishment of agro-dealers as profit-making businesses.

There are mixed methodologies, including demo plots, farmer field schools, and lead farmers working with farmer groups. The methodologies themselves are valid but they can be used for many different purposes. As ACB has discussed elsewhere, Green Revolution initiatives still tend to adopt a 'transfer-of-technology' approach to extension. In such cases the technologies are developed somewhere else and are often driven by competition for market share in boardrooms on another continent, and then farmers must be convinced to use them. Predetermined technologies are made available to farmers and the farmers are reskilled to manage them and all the additional costs and inputs they require. This model is quite different from one where farmers work closely with extension and R&D to identify their own issues and priorities, based on their own experiences, which then become part of the experimentation and resolution in partnership with extension and R&D. Of course, these are not absolutely exclusive. New technologies increase the options available to farmers but there is a problem when the channels of distribution plug a single method and approach only, especially where these are sponsored and subsidised by both the private and public sectors. AGRA and USAID have each sponsored the formation of private sector based agro-dealer networks.

### **Seed**

As with most African countries, Zambia has a dualistic seed system with a small, highly formalised commercial sector focused on maize, and a much bigger, unsupported farmer-managed sector that produces most of the remainder of its seed. There is also a small intermediary sector in Zambia that produces seed for food security and market purposes, which relies on civil society support.

The mainstream definition of quality seed is based on formal processes of certification, which in turn are based on a set of uniform standards looking at issues such as germination, purity, disease-free and moisture content, as well as agro-ecological applicability. While these are useful standards there are a number of weaknesses with the way they are managed. First, the formal regulatory





system insists that seed must be tested at an accredited station, but this places the process out of reach of most farmers. Secondly, and most importantly, the formal regulatory system assumes that any seed that has not been through the formal certification system is automatically of poor quality. This is evidently not true, since farmers regularly rate recycled and locally shared seed as being of good quality. This suggests the need for the development of systems to enable seed producers and users (who are farmers on both sides of the relationship) to develop and deploy accepted ways of measuring quality within their locality, rather than having to rely on costly and inaccessible external expertise.

This is not to say that traditional varieties and farmer-saved seed are perfect. There are plenty of cases of limited availability and restricted choice, attested to by farmers and other actors in the seed system. There is a solid basis from which to argue that varieties that are isolated for too long can lose their vigour and can be beset by diseases that are difficult to eradicate, because they are propagated anew each season. Bringing fresh genetic material and varieties with different traits into a local supply base can have a positive impact, potentially enhancing local varieties.

However, there may also be problems with the quality of certified seed. Certification does not guarantee quality, and because the supply chain is long (from R&D, through basic seed production, through bulking up and multiplication, through agro-dealers and other distributors) before the seed reaches the farmer, there are many places for quality to be compromised. Whether poor quality is a result of uncertified reproduction or can be traced to other flaws in the chain is a question for empirical investigation. Farmers are also suspicious of agro-dealers and other middlemen who may repackage and sell expired seed.

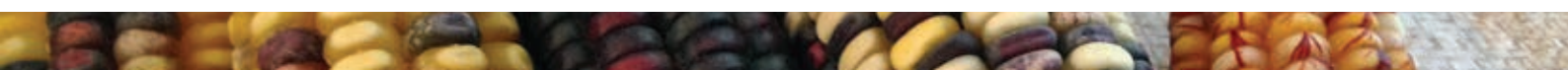
Even when the seed is as the label describes, it may not be appropriate to the local context. In particular, most certified seed is unlikely to live up to its 'genetic potential' (e.g. a yield of 4t/ha) in the context of its real use in resource-constrained conditions. Improved certified seed generally requires generous applications of

fertiliser and a consistent water supply (mainly in the form of irrigation) in order to perform. Demo plots usually operate in ideal conditions with all the required inputs being easily available. It is difficult for most farmers to reproduce these conditions on their own plots. Finally, however good certified seed may be, if this is to become the preferred route it will be necessary to address the major problem of the limited range of certified seed available.

Farmer-managed and commercial seed systems are intertwined, although this relationship is unbalanced. The strong support for hybrid maize leads farmers to move away from local varieties and also results in the displacement of other crops. There are various reasons for the selection of different varieties, even of maize. Yield is a key issue but it is not simply that hybrids produce higher yields, there is also contextual variation. For example, in some areas local varieties are considered to handle drought better, while in other areas hybrids excel. Performance is therefore context specific and yield depends on many factors, not only the variety of seed. Farmers indicated also that yield is only one consideration when selecting varieties to plant, and cited other considerations such as grain density, nutrient density, taste, storability, pest resistance, recyclability and miller preferences. In this context, quality becomes a more complex issue and diversity is a key consideration.

**Farmer-managed seed** production, multiplication and distribution is predominant in Zambia for all crops except maize. However, genetic erosion, including that of wild species, which may become important in a changing climate, is occurring relatively rapidly. The expanding cultivation of maize, sorghum and groundnuts is one of the primary driving factors behind this erosion.

Commercial farming in colonial Zambia was slanted towards the production of cheap maize, to feed mine workers, and horticultural and cash crops for export. **Public R&D** was developed to serve these purposes. Following the collapse of copper prices in the late 1970s, the Zambian government began exploring the potential of small-scale farming. Public institutions began to develop and release a broad range of improved open pollinated



varieties (OPVs) and hybrids, especially in maize. By 1992 most farmers, small- to large-scale, were planting hybrid maize, even if it was sometimes recycled. Funding for public R&D declined after 1992 in the period of structural adjustment and liberalisation. While government renewed its commitment to R&D in the late 2000s, the budget has not returned to the 1970s levels of investment. The local commercial seed sector was and remains highly dependent on public research institutions for access to improved varieties.

The *commercial sector* comprises national and international seed companies that test varieties, provide basic seed, produce seed (including through outgrowers), plan seed production, provide training in seed production practices and crop management, provide seed quality control, process and store seed, and disseminate and sell seed. Seed is distributed through agro-dealers. As usual, the focus is on maize.

The Plant Breeders' Rights Act 18 of 2007 provides for the protection of plant breeders' rights (PBRs) and the registration of plant varieties. The Seed Control and Certification Institute (SCCI) in the Ministry of Agriculture is the designated authority for plant variety protection (PVP) and the implementation, regulation and enforcement of PBRs. The Act protects a good portion of farmers' rights, but does not allow farmers to produce seed for commercial sale without a licensing agreement with the PBR holder. Farmers' rights are recognised and are defined as the right of farmers to produce, reuse, exchange or sell any seed in their possession. However, the African Regional Intellectual Property Organisation (ARIPO) has recently adopted the Arusha PVP Protocol (July 2015) which threatens to undermine these rights should the Zambian government choose to ratify the Protocol.

The Plant Variety and Seeds Act 21 of 1995 (as amended) covers the regulation of seed imports and exports, cleaning, testing, minimum standards of germination and purity, certification, sales and deals with prescribed seed. Once again the SCCI has been designated the certifying authority responsible for administering the Act. Businesses dealing in any of these aspects of seed production and

distribution must be registered, after meeting the requirements of the Act. The Act allows for seed to be sold as quality declared seed (QDS) despite it not having been through the full registration procedure, as long as it was produced by a registered seed producer and has been shown, through testing, to conform to the required standards of germination and purity. In essence, farmers may engage in any of these activities, but they must meet the requirements and conditions and must pay the necessary fees which are determined by the Act and its regulations.

Public sector institutions play a major role in regulating the formal seed sector. Historically they have also played the central role in R&D and seed production. Despite liberalisation and the opening of spaces for private sector involvement in seed R&D, the public sector continues to be the main actor in Zambia. ZARI is responsible for developing seed varieties and improvements suited to different agro-ecological conditions and focuses on both hybrids and OPVs. All those involved in the seed industry can access the Institute's genetic materials on the basis of a Standard Materials Transfer Agreement (SMTA).

ZARI produces the basic breeder seed, processes it into foundation seed and then hands it to seed companies for commercial production on an exclusive basis. The Institute's research is disseminated through government's extension services. ZARI concentrates on crops with high commercial value and with which the private sector is involved, such as maize, wheat and soya beans. This results in a shortage of quality breeder and foundation seed for traditional and self-pollinated crops.

AGRA's work on plant breeding R&D currently supports public sector activity, although it aims to commercialise seed production and distribution. AGRA has provided small grants to ZARI and SCCI for the breeding of improved varieties of maize, rice and sweet potato. Until the mid-1980s, the public sector was the only actor in seed breeding, production and distribution. However, declining public sector expenditure for agriculture and the processes of liberalisation have opened the door to private sector involvement. In 1986 private companies started plant breeding activities



in Zambia with the Maize Research Institute (MRI) being the first of these. Pannar Seed entered Zambia in the mid-1990s following deregulation and liberalisation. However, until the mid-2000s, it kept its plant breeding operations in South Africa and conducted only some evaluations and experiments in Zambia. Until this time its Zambian presence was mainly a trading outpost for the South African company. All breeding material is proprietary. The same approach applied to the initial foray by SeedCo, from Zimbabwe, into Zambia.

One of the reasons given for limited private sector breeding activities in Zambia is the lack of plant breeding capacity, but it is likely also that breeders have been waiting for clarity on PBRs and intellectual property issues to secure their investments. However, the adoption of the Arusha PVP Protocol by ARIPO, in July 2015, is unlikely to have a major beneficial impact on breeding capacity in Zambia, since seed bred elsewhere in the region will enjoy easier access into the Zambian market. Consequently there will be no reason for private companies to establish seed breeding and R&D facilities in each and every country.

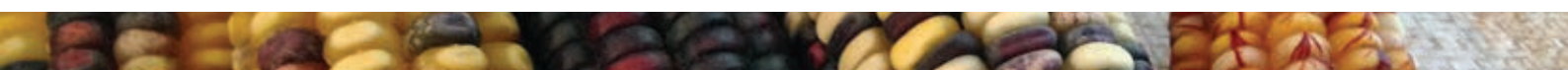
Four private companies dominate seed production in Zambia, namely MRI Seed Zambia Limited, SeedCo, Pannar and Zamseed (the privatised former state-owned enterprise). Figures from 2011 indicate that SeedCo had a 50% share of the Zambian commercial seed market (primarily maize), MRI 17%, Zamseed 15%, Pannar 12%, and Monsanto and Pioneer 3% each. Global mergers and acquisitions in the seed sector are ongoing with a major impact on African commercial seed sectors. In 2012 Pannar was swallowed by the United States (US)-based giant, Pioneer Hi-Bred. In 2013 Syngenta acquired MRI with its extensive collection of maize germplasm. French seed giant Groupe Limagrain, the largest seed and plant breeding company in the European Union, purchased 28% of SeedCo at a cost of US\$ 60m. SeedCo also sold 49% of its shares in its cottonseed company—the only African-owned cottonseed enterprise on the continent—to Indian company Mahyco, which is partially owned (26% ownership) by Monsanto.

Adoption rates in Zambia for improved maize seed are amongst the highest in the region, after Zimbabwe and South Africa, and up to 90% of maize seed is hybrid (including recycled hybrids). It is apparent that the focus of private sector production is on hybrid maize. In 2012 there were more than 210 maize varieties on the official register, while 36 soya bean varieties were next in number. Around 60% of maize seed produced in Zambia is exported, making Zambia one of the largest seed exporters in Africa. Indeed, because it produces so much maize seed for regional trade the country is presented as a resounding success story.

SCCI regulations allow for **QDS** which is evaluated under more flexible criteria. The QDS system is intended as a stopgap to ensure farmers have local access to improved seed in the absence of certified seed. The system can also be used as an intermediate stage of seed production between on-farm recycling without systematic quality controls, and certified seed production that follows rigorous procedures. It is useful for countries with limited resources as it is less demanding than formal certified systems but may still guarantee a satisfactory level of seed quality. However, support for QDS is underfunded and seed growers still need to send seed for testing. There are efforts by some non-governmental organisations (NGOs) in the country to assist farmers to produce certified or QDS seed commercially.

It appears there is a major issue regarding diversification of the varieties being improved and produced. Stringent seed laws and regulations make it difficult for small-scale farmers to be involved in seed improvement and production for commercial purposes. An alternative is to start with in situ or localised experimentation and seed enhancement for specific local conditions, together with farmers, based on their specific priorities. Farmers are innovators and experimenters. They would not survive without these qualities. But they are not being given an opportunity to participate in innovations and experiments.

Zambia's seed laws incorporate aspects of farmers' rights and this is a positive element. Not all farmers want to be commercial producers and a case can be made that any





commercial producer—whether a small-scale farmer or otherwise—should be required to follow a set of standards. But most seed and seed types apart from maize are still being produced year after year by farmers themselves, who experiment with and enhance their seed individually, or in collaboration with their neighbours. Policy does not provide adequate support for these activities; instead, it orients public sector resources and support towards building on this vast base of situated knowledge and expertise.

### **Soil fertility and synthetic fertiliser**

As elsewhere on the continent, Zambian farmers have traditionally practiced aspects of what is now called agro-ecological farming. These practises are about using locally available resources in a way that sustains the resource base over long time periods. Farmers learned and shared these techniques amongst themselves, drawing on direct experience and experimentation. However, the introduction of subsidised synthetic fertiliser has damaged sustainable agro-ecological practices. Expansion onto virgin lands supported by subsidised inputs has exacerbated deforestation rates. Fallow periods were reduced as a result of intensification of production in an effort to raise yields. Nutrients that were lost due to soil erosion, leaching and removal through harvesting, are not adequately replaced and the result is that arable cropland is severely depleted. The spread of cattle diseases in the 1990s following the withdrawal of government services such as cattle dipping (the process of liberalisation going hand in hand with the Green Revolution), also affected soil fertility and roughly half the country's livestock had to be destroyed. Essentially, the Green Revolution and the agricultural liberalisation that underpins its expansion are creating the need for synthetic fertiliser—as traditional soil fertility practices are disrupted, the soil itself suffers, and this is used as evidence that synthetic fertilisers are necessary.

Zambia's soils are generally considered to be acidic, thus justifying some kind of intervention. But the introduction of synthetic fertilisers is mainly to boost nitrogen to increase yields, not to respond to acidity (which

would require liming), and maize requires close to 75% of the available fertiliser. The logic behind the introduction of synthetic fertilisers is that soils lack crucial nutrients or are unbalanced in other ways that limit yield potential. However, this is not based on context-specific evidence. The last national soil survey was done over three decades ago and it is certain that there are no systematic localised surveys, which are necessary to understand soils in a particular context rather than in general terms. This begs the questions of how nutrient deficiencies are identified, and what remedies are proposed. The current flawed approach is profoundly unscientific and seems to be more about creating a market, both for hybrid maize seed and for synthetic fertiliser, than it is about identifying and resolving specific soil nutrient deficiencies.

The vast majority of fertiliser is used by commercial farmers and beneficiaries of the FISP, which services the better-off small-scale farmers with larger landholdings. The International Fertiliser Development Centre (IFDC) estimates that an additional 248,000 tons of fertiliser will be required to meet agricultural growth targets outlined in the CAADP country investment plan. This requires investments that are oriented towards the development of fertiliser value chains to deal with the doubling of fertiliser importation, storage and distribution. It is a circular logic: the imperative of growth described in Green Revolution policies leads to the imperative for greatly increased synthetic fertiliser use. But fertiliser is very expensive, hence the need for government subsidies, and this diverts resources that are critically needed elsewhere, in order to support multinational corporate (MNC) penetration into Zambian agriculture.

Zambia is a 'price-taker' where fertiliser is concerned; domestic production of fertiliser is limited, so the country is forced to accept prevailing prices in the market. There are ten major fertiliser importers in Zambia, including two domestic blenders and a state-owned manufacturer. Distribution is primarily through FISP which delivers to district governments and cooperatives through agro-dealer networks.

The NAP proposes a diverse set of interventions on soil fertility, promoting "environmentally



friendly farming systems”, grain-oil seed crop rotations and the decentralised production and marketing of fertilisers. However, in practice, as indicated above, most of the budget is channelled towards input subsidies. ZARI’s Soil and Water Management Division (SWMD) is the principal institution responsible for overseeing soil health in Zambia. Its primary activities include researching and promoting the use of organic and inorganic fertilisers, promoting the use of inoculants in soya bean production, the evaluation of soil types, and there is some focus on conservation farming. It also offers soil sampling services.

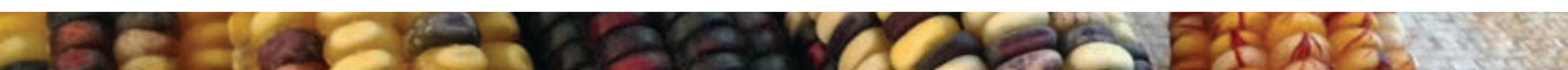
AGRA’s Soil Health Programme (SHP) absorbed around 22% of AGRA grants to Zambia in the years 2007–2012. Only three grants were awarded: two to ZARI, worth US\$ 1.54m (80% of the value of SHP grants), and one to the University of Zambia (UNZA) for the remainder. The programme promotes the use of integrated soil fertility management (ISFM) accompanied by the application of synthetic fertilisers. ISFM practices include combining the use of mineral fertilisers, inputs such as lime or rock phosphate, and organic matter; agroforestry; crop rotation and intercropping with legumes; and conservation farming.

In 2013 AGRA funded the establishment of the Zambia Soil Health Consortium (ZSHC), coordinated by the International Plant Nutrition Institute (IPNI), to provide a national forum to address soil health issues. This consortium forms part of the wider regional group, the Soil Health Consortia for Eastern and Southern Africa, and the African Soil Health Consortium at the continental level. The Zambian consortium brings together a variety of players working on soil issues in that country, including ZARI, the Golden Valley Agricultural Research Trust (GART), the Conservation Farming Unit (CFU), and the UNZA, as well as NGOs and private sector seed and fertiliser companies. The first phase of the ZSHC’s work is desktop based research to collect and synthesise available information on different areas, in order to develop policy recommendations and identify research gaps. The current AGRA grant is coming to an end and it is intended that government will take over the funding.

Conservation agriculture (CA), or **conservation farming** as it is named in Zambia, is based on three primary principles: minimal mechanical soil disturbance, permanent organic soil cover and crop rotation. In Zambia this is generally considered a success story for sustainable agriculture. A number of organisations promote conservation farming in the country, including programmes funded by grants from international organisations, such as USAID, government programmes and local NGO initiatives. Concern and CFU are two organisations that promote conservation farming. CA is closely associated with the more recent climate smart agriculture (CSA). Most mainstream proponents of both CA and CSA tend to adopt an integrated approach to the core principles, with many supporting the use of synthetic fertiliser and pesticides. Herbicides are often included. The indiscriminate use of pesticides poses ecological and health hazards. Ecologically it is known to damage the habitat, reducing biodiversity above and below the soil with far-reaching consequences on the ecosystem balance. As a result, training is oriented away from agro-ecological techniques and towards safety, correct quantities and handling of poisons, the timing of applications, and so on.

## Conclusions and further research

Zambia has gone a long way down the Green Revolution path, in particular through the huge outlay of public resources to sponsor FISP and the FRA. These programmes have influenced production patterns and oriented farmers towards hybrid maize in particular. This has come at the cost of diversity in production, the undermining of traditional seed varieties, the marginalisation of agro-ecological production practices, and has created a technological and financial treadmill on which farmers are forced to keep using these technologies, even if the results are mediocre. Farmers in Zambia are increasingly dependent on subsidised inputs over which they have no control, because the inputs rely on capital-intensive production processes and expertise. While there is widespread recognition of the limits to the long-term sustainability of the subsidised input route, even politicians have become dependent on its structures. It will be difficult to move away from this approach in



the short term, despite the fact that farmers remain as deeply mired in poverty as they were prior to a decade of subsidies. Therefore intermediate strategies may be required aimed at diversifying resources in order to support possibilities and alternatives that are not contained in the purely Green Revolution package.

AGRA's role in Zambia is contradictory. On the one hand, it is investing resources in building public sector capacity in plant breeding and ISFM, which may have some benefits. On the other hand, AGRA functions in such a way that it lays the ground for the entry of multinational corporate agribusinesses that extract value at the expense of farmers. It has also elected to build private, for-profit agro-dealer networks that operate within a top-down model of technology transfer, with limited farmer participation in the development of technology, rather than investing in bolstering the capacity of public sector extension. Demo plots and farmer field schools tend to demonstrate pre-determined technologies instead of providing farmers with a diverse range of options from which they can choose. Systematic assessments of AGRA's work on the ground are scarce. We are less interested in the numbers of farmers reached or even the number of seed varieties developed, and more interested in whether farmers find that AGRA's contributions add value to their activities. Anecdotal evidence from Zambia and elsewhere suggests that the agro-dealer networks are expensive and do not offer farmers an adequate service. There may be other ways of conducting outreach that are more cost-effective and more responsive to farmers' needs.

As indicated, from a seed point of view the focus is almost exclusively on hybrid maize. Efforts to diversify R&D to cover different crops should be supported. AGRA and others in the GR stable support efforts to privatise the production of certified seed and suggest that this is the only viable option for the expanded availability of quality seed. However, contradictory trends are also apparent: for example, efforts to privatise the production of certified seed and suggestions that this is the only viable option for the expanded availability of quality seed. Contradictory trends are under way: there is a growing recognition that an

exclusive focus on hybrid maize is detrimental in the long run, and at the same time there are efforts to build public sector breeding capacity. On the other hand, regional PVP harmonisation processes sever these positive developments by making it far simpler for MNCs located outside Zambia to breed and register seed in countries in which they are already established, and then bring them into Zambia through regional channels. This is contrary to statements that PVP and the protection of proprietary intellectual property (IP) will give the private sector greater confidence to invest in plant breeding in all countries in the region. Associated with this, the push to marginalise the public sector regarding seed multiplication in favour of private commercial enterprises also opens the door for the acquisition of domestic seed companies by MNCs. There is ample evidence of this in the region with impacts on the Zambian seed sector. For example, the acquisitions of SeedCo, Pannar and MRI by US and European corporations in recent years has witnessed the MNC concentration of control in the seed sector in Zambia.

While stringent quality controls and standards for the formal sector are important to protect farmers from opportunistic behaviour, the formal system may also benefit from greater flexibility which would enable farmers in their own localities to produce and share quality seed. Large-scale corporations tend to prefer standardised and uniform technologies across large areas, to generate the necessary economies of scale for them to recoup their investments and make a profit. As such, smaller, more localised pockets of demand are bypassed. The seed laws make it difficult for smaller players to fill these localised gaps because they must go through the same procedures and pay the same fees as the multinationals. On top of this, the seeds being produced by MNCs are directly and indirectly subsidised through FISP, the FRA and the many public-private partnership (PPP) breeding support programmes in operation in Zambia.

The above also speaks only to farmers who want to produce certified seed for sale. But there is the far larger—side-lined and ignored—demand for a vast array of locally-adapted seed varieties of many less commercially important crops that are not

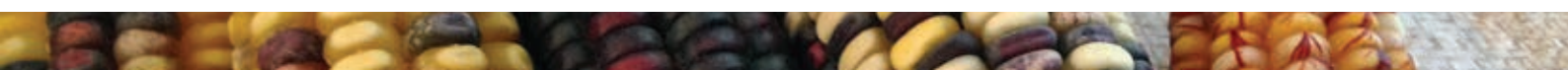




necessarily in need of formal certification. There are few programmes or resources directed towards supporting in situ seed enhancement and quality control managed by farmers themselves, to meet their own and their neighbours' needs. There is no good reason why these activities should be subjected to stringent formal certification systems, or criminalised. Such subjection will lead to the collapse of biodiversity, poorer nutrition for rural and farming households in particular, loss of resilience, and an increasing brittleness of rural livelihoods. As suggested, with regard to the Green Revolution as a whole, a promising direction lies in 10 diversified programmes that cater for these more localised seed enhancement and distribution processes, that support farmer control over these processes, and that link public sector R&D and extension with farmers' priorities and practices to build localised systems, introducing non-proprietary germplasm and expertise as required.

A scrutiny of soil fertility leads us to confront again the dominance of the FISP package that steers farmers towards synthetic fertiliser use, based on uniform, blanket offerings. It may be true that Zambia's yields have increased since the FISP programme (though by all accounts this is not by a huge amount). However, this has come at the cost of a crippling dependency which forces farmers onto a treadmill: declining soil quality must be countered with a greater application of (subsidised) fertiliser, which in turn leads to a further decline in soil quality, and so on, in a vicious cycle.

Farmers have lost control of soil fertility management—decisions are made by experts from outside and products which are not necessarily appropriate to local conditions are foisted on farmers. A potentially fruitful path of investigation could be (1) to identify and share simpler methods and technologies that farmers can use to assess nutrient requirements in situ, on their own plots, and (2) to start the search for required nutrients within the locality, before jumping immediately to the global level. There is general agreement, even amongst private fertiliser companies, that organic content is an essential ingredient. CA and ISFM try, to some extent, to encourage the practice of increasing organic content, especially through the use of crop residues for mulch. But there is also a tendency to lean on synthetic fertilisers as a quick fix, or to promote the use of herbicides which destroy biomass and poison the ecosystem. There is no doubt that there are challenges to increasing the organic content of the soil. It is labour intensive and it is often elderly people or women who end up doing this work, in addition to their other daily tasks. Availability of biomass may be limited, apart from maize residues which are regularly consumed by termites and livestock. Animal manure, a key source of nitrogen, is in short supply, especially since agricultural liberalisation which saw the decline of essential public services (e.g. dipping) which in turn led to a precipitous drop in the number of animals.



## INTRODUCTION TO THE RESEARCH

The research is part of a three-year multi-country programme that explores the impacts of the Green Revolution on small-scale farmers in southern Africa, with a particular focus on seed and soil fertility. Research started in Malawi and Tanzania in 2014, and parallel research in Mozambique and Zimbabwe was conducted at the same time as the Zambia research. We started with a focus on the interventions and activities conducted by AGRA, an initiative started by the Bill and Melinda Gates Foundation together with the Rockefeller Foundation in 2006.<sup>1</sup> In the course of our research in Malawi and Tanzania we noted that AGRA is just one component of a much larger Green Revolution agenda. Consequently we have widened our scope to try to acquire a broader picture of coordinated Green Revolution activities in various countries in which the research is being conducted.

While AGRA is operational in Zambia its activities there are not as geographically focused as they are in Tanzania and Mozambique, because Zambia is not an AGRA breadbasket country. We aimed to speak to farmers involved in AGRA projects in Zambia, hoping to acquire an understanding of their experiences and insights, and we wanted also to ensure that we connected with farmer organisations (FOs) or farmer support organisations (FSOs) during our research. We thus opted to investigate activities in which member organisations of the Zambia Alliance for Agro-ecology and Biodiversity Conservation (ZAABC) are involved, including alternative agro-ecological activities of these organisations. This approach means we are not targeting AGRA projects only, but are starting

a process of research to discover the situation on the ground, working together with local organisations that work with farmers. This report should be treated as an initial scoping study to determine the lay of the land and to inform possible future work in Zambia. In this we will seek to strengthen links with the ZAABC, the Kasisi Agricultural Training Centre (KATC), and other civil society organisations in Zambia.

The broader research programme has two process objectives:

1. To support the formation of country-based action research co-operation, linked to farmer associations and progressive movements, on issues of seed and soil fertility in relation to the above; and
2. To connect country researchers with one another, across countries, to share and discuss research results and contribute to plans and activities to realise food sovereignty.

Apart from desktop work we conducted field work in the form of key informant interviews and focus group discussions with farmers from Chongwe and Rufunsa in the Lusaka province, and from Nadezwe in Chikankata in the Southern province. ZAABC's part-time coordinator, Frances Davies, conducted the interviews and focus groups in her personal capacity. Despite our distance, we believe the scoping is the first step to possible follow-up work in partnership with organisations located in Zambia. We aim to explore further ways of working with civil society organisations (CSOs) in Zambia towards strengthening farmer-managed seed systems, supporting practices by smallholder farmers concerning agro-ecology, especially soil fertility, and how to deal with restrictive seed laws and the distorted support for chemical fertilisers and hybrid maize seed through the FISP.

1. [www.agra-alliance.org](http://www.agra-alliance.org).



## BACKGROUND TO LAND AND AGRICULTURE IN ZAMBIA

Zambia's population is around 15 million, with a per capita gross national income (GNI) of US\$ 3,810 in 2013.<sup>2</sup> Although this figure places Zambia in the lower middle-income country category, two-thirds of the population live in poverty. Zambia is one of the most urbanised populations in the region—over 40% urbanisation—mostly in unplanned settlements.<sup>3</sup> Poverty is more prevalent in the outlying rural provinces which are home to about 9 million people (FAO, 2013). About 6.2 million people are economically active in the formal sector (IFAD, n.d.).

Zambia's formal economy is built on mining, especially copper. Minerals have constituted around 95% of Zambia's exports for most of its history since colonialism, and are still at more than 85% of exports.<sup>4</sup> Nevertheless, the vast majority of the population was, and remains, reliant on agricultural production for their survival. Zambia had a GDP of around US\$ 27bn in 2013, with services (including construction), industry (including mining and minerals processing) and commercial agriculture the main activities in order of importance.

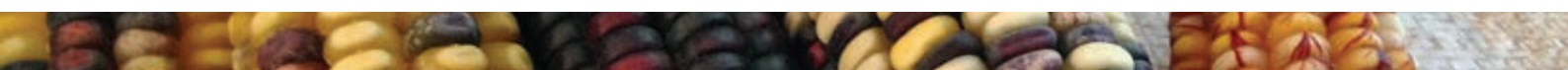
Since independence in 1964, the Zambian government has looked to the agricultural sector to drive development for the predominantly rural population. The agricultural sector contributes around 13% to the national GDP and has taken a distinct downward trend over the past 15 years, typical of an urbanising economy. But agriculture remains very important for the majority whose daily survival depends on agriculture. GDP is a measure of the commercial sector of the economy and thus excludes most agricultural production for household or neighbourhood use; if non-commercial farming is included it

is, at best, merely estimated. More details are provided on the agricultural economy below.

Following independence Zambia adopted a market economy and this continued until the early 1970s when the government chose to nationalise some industries and operations, including the copper mines. However, this ran against the grain of global developments (the collapse of Bretton Woods and the rise of neo-liberalism) and the government was forced to adopt the structural adjustment programme (SAP) imposed by the IMF. At the same time the price of copper declined dramatically and Zambia's economy entered a difficult period. This was the start of neo-liberal policies in Africa, which accelerated in the 1990s with global integration through the World Trade Organisation (WTO) and other transnational legal and financial instruments. The Zambian government liberalised the national economy in 1991 and this included the deregulation of agricultural markets and trade (Ministry of Agriculture and Livestock (MAL), 2013). It also privatised the copper mines which resulted in increased copper output and profitability for private sector mining interests (African Growth and Opportunity Act (AGOA), n.d.).

Zambia qualified for US\$ 6bn in debt relief under the Highly Indebted Poor Country (HIPC) Initiative in 2005. The economy has subsequently grown at more than 6% a year to the present. However, the benefits of this growth were unevenly distributed and poverty remains a significant problem. The country's continuing dependence on copper as an export commodity leaves it vulnerable to volatile international markets. High GDP growth rates were driven primarily by high global copper prices until 2012, and by investments in sectors such as telecommunications, construction, retail and manufacturing (MAL, 2013). Together with low inflation rates this has encouraged consumer spending. Construction accounted for around 29% of GDP in 2014 (Rasmussen *et al.*, 2014). Government has invested more than

2. [https://www.google.com/publicdata/explore?ds=d5bncppjof8f9\\_&met\\_y=ny\\_gnp\\_pcap\\_pp\\_cd&idim=country:ZMB:TZA:MOZ&hl=en&dl=en](https://www.google.com/publicdata/explore?ds=d5bncppjof8f9_&met_y=ny_gnp_pcap_pp_cd&idim=country:ZMB:TZA:MOZ&hl=en&dl=en).
3. <http://lusakavoice.com/2013/05/07/majority-of-zambians-will-live-in-cities-by-2030-kabanshi/>.
4. [https://upload.wikimedia.org/wikipedia/commons/5/53/Zambia\\_Export\\_Treemap.png](https://upload.wikimedia.org/wikipedia/commons/5/53/Zambia_Export_Treemap.png)





US\$ 5bn in recent years to rehabilitate the national road network and promote regional transport corridors, in particular the North-South and Nacala Corridors (of which more below) (African Development Bank (AfDB), 2010).

### Agro-ecological zones

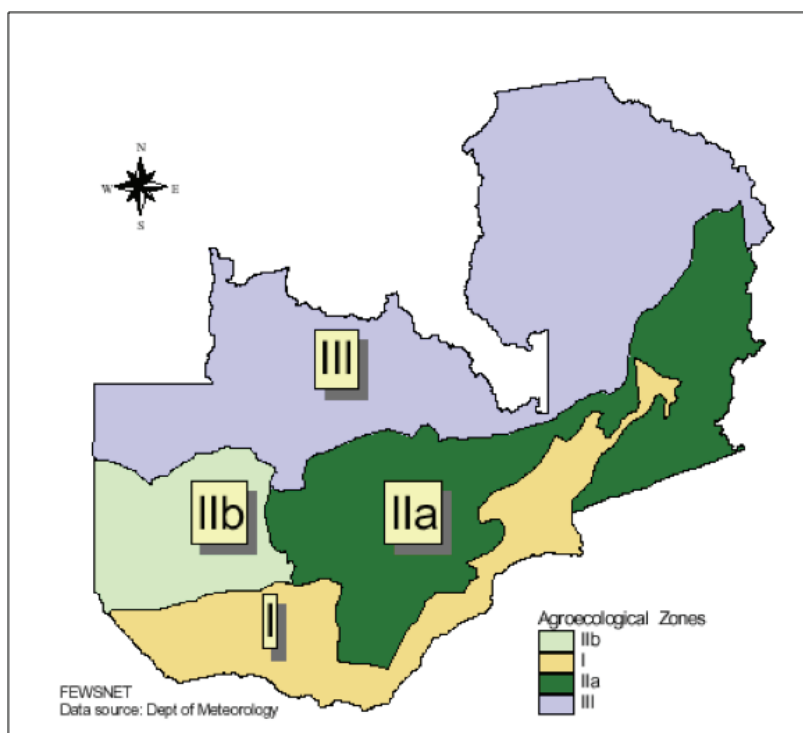
Zambia is divided into three broad agro-ecological zones (Figure 2). The southern and eastern parts of the country (Zone I) are drier and predominantly planted to drought-tolerant crops such as sesame, sorghum and millet, with extensive cattle grazing. Maize, irrigated wheat, groundnuts, millet, sunflowers, tobacco, cotton, rice and other crops are planted in the central areas—the most agriculturally productive areas with higher rainfall (Zones IIa and IIb). The north of the country (Zone III) receives higher rainfall and has typically acidic soils. This region is planted to millet, cassava, sorghum, beans, coffee, sugar cane, rice, pineapples and bananas amongst others (IFDC, 2013:9).

### Land and agrarian structure

Zambia has a total surface area of 753 000 km<sup>2</sup> (75.3m ha). There are widely divergent estimates of the amount of land available for agriculture. The World Bank has said that forests cover about 56% of the land area, and agricultural land constitutes about 25.6m ha; that around 80% of agricultural land is permanent pasture, and the remainder (around 5.3m ha) is arable land.<sup>5</sup> According to the IFDC (IFDC, 2013:10) until 2010 about one third of arable land was under production. The area under production is likely to have expanded over the past five years, especially given investments in commercial agriculture. Elsewhere, the 2011 NAP indicates that around 42m ha has medium to high crop production potential (Ministry of Agriculture and Cooperatives (MACO), 2011:1). So it is difficult to say how much land is actually available for agriculture.

All land is held in trust by the state; 94% is designated customary land and access and use

Figure 2: Zambia agro-ecological zones



Source: [http://img.static.reliefweb.int/sites/reliefweb.int/files/resources/AoBoFD1315C56BDF49256F40001CDB40\\_o.gif](http://img.static.reliefweb.int/sites/reliefweb.int/files/resources/AoBoFD1315C56BDF49256F40001CDB40_o.gif).

5. <http://en.worldstat.info/Asia/Zambia/Land>

is controlled by chiefs and village headmen. Most of Zambia's ethnic groups are matrilineal, with land passing through the female line to male family members who generally control land use.<sup>6</sup> The remainder of the land is statutory tenure with accompanying formal registration and title rights (renewable 99-year lease). The president can grant title to these lands (MAL, 2013). Since enactment of the 1995 Lands Act which allows for conversion of customary land to leasehold, at least 10% of customary land has been converted for investment purposes.<sup>7</sup> Other sources say about 280 000 ha of customary land has been sold, at an average of 54 ha per transaction (Sitko & Jayne, 2014). The vast majority of the acquisitions are in the urbanised provinces of Lusaka, Central and the Copperbelt. The NAP says that the Ministry of Agriculture and Livestock will work with the Ministry of Lands "to increase the number of farmers with title deeds as an incentive for them to adopt sustainable land management practices and enhance the collateral value to enable them to access credit" (MACO, 2011:16). Land as collateral is a step towards the alienation and dispossession of land—title converts land into a commodity priced on the market.

About a decade ago roughly three quarters of Zambia's farmers were small-scale (<10 ha), around 24% were considered emergent and medium-scale farmers (10–60 ha), and 1% were large commercial farms (>60 ha) (Aregheore, 2007). Among the small-scale farmers around 70% cultivate less than 2 ha of land. Land access is an issue for many small-scale farmers of whom an estimated 56% believe there is limited land available to farm, because traditional leaders have already allocated most of the land in and around their villages (MAL, 2013). Up to 72% of respondents in the central provinces held this view (Sitko & Jayne, 2014). The system is open to abuse by traditional leaders who can choose to access customary land for their own benefit (MAL, 2013). The tradition of sub-dividing to bequeath access to future generations further diminishes land size. Figures from 1960 to 2009 show that



Chikankata farmer yard with grain storage

Zambia has experienced a dramatic reduction in the ratio of cultivated land to agricultural population, from 0.64 in 1960–69 to 0.29 in 2000–09 (IFDC, 2013:10). This is a sharper drop than in neighbouring countries over the same period.

Emergent farmers are concentrated in districts with railway access and close to mining areas, giving them ready access to urban markets. There is a process of consolidation of land holdings taking place in Zambia's rural areas. Farmers cultivating 10–20 ha increased in numbers by 101% between 2004 and 2012. The number of medium-scale emergent farmers cultivating 5–20 ha of land grew by 62%, compared with a 33.5% growth for smallholders. Today, farms ranging from 5–100 ha in size account for more land than those with less than 5 ha (Sitko & Jayne, 2014). This is not necessarily indicative of an accumulation process by small-scale farmers who have managed to increase their incomes and 'move up the ladder' to commercial farming; it is primarily due to salaried urbanites and privileged rural families who acquire land (Sitko & Jayne, 2014). On paper, however, it aligns with the premise that the expansion of small-scale farming and the development of emerging and commercial farms are key

6. <http://www.focusonland.com/countries/zambia/>.

7. <http://www.focusonland.com/countries/zambia/>.

contributors to the growth of the agricultural sector (Southern African Trade Hub (SATH), 2015).

Government strategy appears to be a combination of the gradual consolidation of smaller parcels of land into slightly bigger units, and the allocation of large blocks of land for commercial agriculture for some outgrowers. This is despite government noting that the size of land correlates to the farmer's capacity to commercialise production and that this is more effective with an increase from 2–3 ha than increases above 5 ha (MAL, 2013).

The state has allocated around 1m ha of customary land to the development of farm blocks of 100 000 ha or above (Appendix 1), for which it will invest in electrification, water, roads, schools, clinics and other services (Sitko & Jayne, 2014). At least one block is allocated in each of Zambia's provinces. The plan is to have one core commercial venture on 10 000 ha, one to three commercial farmers on 1 000–5 000 ha each and medium-scale, emergent and small-scale farmers working on smaller areas in outgrower schemes. The focus is on high-value crops for export, such as cotton, pineapples, palm oil, tea and cashew nuts (Shawa, 2014).

Invited bidders for the Nansanga farm block in the Central province included Crookes Brothers Ltd from South Africa; Polyserve Fertilisers and Chemicals from Egypt; Sea Agriculture Consortium and Chayton Capital LLP from the United Kingdom; and Yuan Longping Hightech Agriculture from China (Oakland Institute, 2011). Media reports indicate that during the process to establish the Nansanga farm block the state evicted 9 000 local residents because they were unable to meet the application requirements for the acquisition of land (Sitko & Jayne, 2014).

International investment funds have also procured land in Zambia. Emergent Asset Management Ltd, which targets an annual return of 25% for its investors, has procured 1 700 ha in the Livingstone area, from a

traditional chief in order to grow export crops. Chayton Atlas is setting up a US\$ 50m agribusiness chain and plans to develop up to 10 000 ha. The Danish-based Silverland Fund, which had US\$ 450m to invest in six sub-Saharan African countries, has plans to set up smallholder outgrower schemes as part of its investment (Oakland Institute, 2011). In late 2014, TALMED, a Chinese agribusiness, announced plans to invest US\$ 7m in a commercial farm in the Mukumpu area, to produce soya beans, maize and wheat (farmlandgrab.org, 2014).

GRAIN<sup>8</sup> has estimated that 3% of Zambia's farmlands were controlled by foreign interests a few years ago (Oakland Institute, 2012) although it is not clear what the terms of such control are; for example, are they outright purchases or long leases, and are any operations taking place on this land. There are reports of large-scale evictions following the sale of land to foreign investors—2 000 farmers were evicted from land in the Masaiti district in 2011, when the land was acquired by Dangote Cement from Nigeria. The expansion of mining interests has also left thousands of smallholder farmers homeless and without access to land to cultivate (Oakland Institute, 2012).

## Main agricultural activities

The main crops by area harvested in 2014 were maize (52% of the area of the top 8 crops), followed a long way behind by cassava (11%), groundnuts (11%) and seed cotton (9%) (FAO, 2013). Other important crops are wheat, soya beans, sunflower seeds, pulses, tobacco, sorghum, sugar, horticulture and others.

The main staple crops in Zambia are maize, cassava, sorghum and pearl millet (Hamukwala *et al.*, 2012). As with other countries in the region, maize dominates production. Farmers said that “when you talk about farming, you talk about maize”.<sup>9</sup> Nearly 1m ha is dedicated to growing maize with an average crop yield of 1.5 to 2t/ha (SATH, 2015). This is about a third of the global average and most smallholders

9. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.





realise only half these yields (Feed the Future (FtF), 2011). Prior to liberalisation, maize constituted about 60% of the area under production. Maize is referred to as a 'politicised crop' because of government interventions. Recent years have seen bumper harvests as a result of Green Revolution technologies and the input subsidy scheme (more below), and maize production doubled between 2008 and 2010 (MACO, 2011:5). However, this increased production comes with market and storage challenges. Despite this rapid growth, government price controls and interventions in both maize markets and input distribution are considered to be 'crowding out' the private sector (MAL, 2013), signifying profitable opportunities for private operators in maize markets.

Small-scale farmers, as elsewhere on the continent, produce primarily for household use and surpluses are sold or exchanged locally. Maize for sale is usually managed by men, while women are responsible for legumes and vegetable production, mainly for household use.<sup>10</sup> An estimated 21% of small-scale farmers produced a surplus for sale in 2008, and 36% of farming households purchased maize for their own use (MAL, 2013). An estimated 2% of farmers produce 50% of marketed maize, and 60% of farmers in an average year are hungry for several months.

The cultivation of cassava, the second most important staple crop, is confined to the northern parts of the country. Groundnuts are often inter-planted with maize. Major export crops are tobacco, cotton, tea and coffee, with cut flowers as a growth area. A few years ago there were about 400 000 smallholder households involved in agribusiness in out-grower programmes, primarily focused on cotton and other cash crops (World Bank, 2012).

The main livestock in Zambia are cattle (beef and dairy), with some poultry, pigs, sheep, goats and other small ruminants. There were estimates of 3m head of cattle in 2010, at a low rate of 0.14 head of cattle/ha on average.



Chikankata farmer displaying some of the crop variety she has grown. Stored in the house, home consumption, seeds saved.

This compares with 3 head/ha in Zimbabwe and 4 head/ha in Kenya. More than 80% of Zambia's herd is under traditional (non-commercial) management. Emergent farmers hold about 15% of the herd, while commercial producers manage around 5% (UKAID and World Bank, 2011:1). Most of the livestock is held in the South, Central and Eastern provinces, which are the drier areas and where extensive grazing is practiced, although other areas have livestock potential. Per capita meat consumption in Zambia was about half of Africa's average consumption about a decade ago (Aregheore, 2007) and still is lower than the regional average.

Zambia holds almost half southern Africa's water resources, given its location in the Zambezi and Congo river basins with five major lakes: Kariba (man-made), Bangweulu, Mweru, Mweru-Wantipa and Tanganyika (MAL, 2013). There are 1 700 dams in the country with the potential to irrigate about 2.75m ha. Currently only about 156 000 hectares are irrigated in areas close to ground and standing water (rivers and dams), which are predominantly planted to sugar cane, wheat, rice, coffee, bananas and citrus fruits destined for export. According to the MAL, the irrigation of crops can achieve a potential four-fold increase in yields over that of rain-fed agriculture (MAL, 2013).

10. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

11. Interview, Charles Nkoma, Director, Community Technology Development Trust (CTDT), Lusaka, 10 June 2015.

The 2015 Budget allocates funds to bring irrigation to 6 000 ha in the year, which will bring government supported irrigation overall to 17 500 ha, which is 11% of the total acreage under irrigation (Shula, 2015). Government has plans to construct at least one smallholder irrigation scheme in each province.

The SWMD within ZARI tests and promotes the use of cheap and affordable drip-irrigation systems and water lifting devices, (e.g. treadle pumps); develops irrigation scheduling technologies for various food and tree crops; conducts investigations in the use of waste-water for irrigation purposes; and monitors the quality of irrigation water (ZARI, 2015).

## THE GREEN REVOLUTION IN ZAMBIA

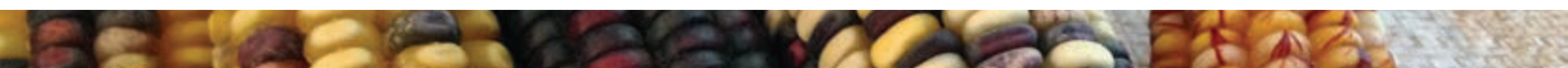
*The type of farmers that the system is promoting now, the high level producers, the country requires very few. You can't have 80% of the population doing this. So it's completely contradictory to what they say they are doing.*

Charles Nkhoma, Community Technology Development Trust (CTDT).<sup>11</sup>

Zambia liberalised the agricultural input market in 1991 by authorising the Investment Act, which provides legal protection and tax incentives for private investment. The government signed the CAADP Compact in 2011 and aligned the 2012 NAP to the Compact (MACO, 2011). NAP offers a typical Green Revolution policy framework: productivity, input and output markets, public and private institutional capacity and access to productive resources for small-scale farmers. It aims to realise a predictable and stable environment for agribusiness production and commercialisation and is private sector driven but provides for a government role to create an enabling environment (MACO, 2011:v).

Zambia's National Agriculture Investment Plan 2014–2018 (NAIP) is aligned with its 6th National Development Plan and the CAADP Compact. NAIP aims to act as a catalyst for the sector by re-orienting policy and legislation to create an enabling environment for the private sector to lead agricultural growth (MAL, 2013). It operationalises the NAP and, according to MAL, "NAIP implementation will be led by the private sector with government through MAL focusing on the implementation of an enabling environment to facilitate and promote private sector led agricultural growth" (MAL, 2013:4). An Agricultural Sector Advisory Group (Ag SAG) was established to provide co-ordination of this implementation.

Zambia's Green Revolution and private sector led orientation must be contextualised within broader global and regional processes where multilateral, public and private investment alike is contingent on the adoption of a particular set of policy prescriptions. Zambia



**Figure 3: Growth corridors in southern Africa**



Source: Rose-Innes, 2011.

had already encountered this in the 1980s and 1990s, during its structural adjustment and subsequent liberalisation. In the area of agriculture, the harmonisation of seed laws (see seed section below for more detail) and the activities of the G8's New Alliance for Food Security and Nutrition (NAFSN) have made it very difficult for governments to follow their own path without becoming isolated from their neighbours and resource streams.

Long-term programmes of regional economic integration are coming to fruition, albeit unevenly; for example, the regional development corridors. Lusaka has become the regional hub for agricultural corridors in southern Africa and is the start and end point of no fewer than four regional corridors: the North-South Corridor through Zimbabwe and Botswana to South Africa (Durban via Gauteng); the Beira and Nacala Corridors to Mozambique; and the Dar es Salaam Corridor through SAGCOT. The North-South Corridor also feeds the Trans-Capriivi, Trans-Kalahari and Lobito-Benguela Corridors to the west (Figure 3). Zambia is landlocked and its shortest route to the sea is through the Beira and Nacala Corridors in Mozambique (IFDC, 2013:8). For imported fertiliser and global exports this is absolutely crucial.

There is a growing body of literature on the agricultural corridors in southern and eastern Africa which reviews the corridors as a strategic intervention and also assesses the results of the intervention. Generally, we can say the corridors are blueprints for public-private investments over 20-year time spans; but they are heavily dependent on mining and other energy investments in the transport and communications infrastructures, in particular, before the agricultural component kicks in. Mostly they are a combination of different strategies, with some large-scale commercial projects for export markets, coupled with interventions to commercialise small-scale agriculture. This combination is meant to enable small-scale farmers to take advantage of infrastructure to reach commercial markets in urban areas and for export. Small-scale farmer investments focus on irrigation, Green Revolution 'improved' seed and synthetic fertiliser technologies, financing, securing output markets and other familiar Green Revolution interventions. Despite the explicit reference to small-scale farmers, in practice this approach is often lost. A Green Revolution commercial agriculture approach generally favours a relatively small, elite group of farmers who are able to take advantage of the opportunities provided by these interventions. Recent studies indicate that development



corridors can benefit only 2–10% of smallholders at best, and to date the corridors have favoured the interests of multinational private sector and domestic elites (Byiers, 2013; Vorley *et al.*, 2012).

To date, the anticipated corridor investments and infrastructure developments have not materialised as expected, although smaller projects and pockets of activity may exist. This is not surprising given the economic crisis of 2008 and the after-effects of lower or uncertain commodity prices, especially in energy, given the drop off in global demand. This means that planned investments are relegated to the back burner, and this which has the knock-on effect of delaying agricultural investment. This is not to say that there is no interest in agricultural modernisation itself, but that most private sector and even government agencies shy away from infrastructural costs that may be too expensive to justify, without a long-term money spinner—such as energy or mining—to offset some of the costs.

### **Government emphasis on input and output markets: FISP and the FRA**

Agriculture spending as a portion of the national budget increased from 12.2% in 2007 to 13.6% in 2011, but 80% of this was spent on input subsidies (fertiliser and seed) through the FISP and the procurement of maize through the FRA (Tembo and Sitko, 2013).

### **Input markets and the Farm Input Supply Programme (FISP)**

Input subsidies have been part of Zambia's landscape since independence. However, in the 1990s with structural adjustment, these programmes were curbed for a time. One of the results of this restraint was a decline in maize production. In the early 2000s government decided to reinstate subsidies for fertiliser and hybrid maize seed in the form of the Fertiliser Support Programme (FSP) to counter this

trend. This was made possible through direct budget support by donors as well as increased government revenues from improved copper prices (Mason, *et al.*, 2013:615). Beneficiaries had to have the ability to cultivate 1–5 ha of maize, be members of a recognised and registered farmers' group or cooperative, and had to be able to pay towards the costs of the inputs (World Bank, 2010).

FISP took over from the FSP in 2009 and subsidies rose from 50% on fertiliser and seed in 2002, to 79% on fertiliser and 53% on seed in 2011/12 (Mason *et al.*, 2013:616). There were some changes to the programme, notably the halving of the input pack to 200 kg of fertiliser and 10 kg of seed, which theoretically meant the possibility of widening the number of beneficiaries. In addition, under FSP cooperative boards and extension officers selected the beneficiaries, whereas under FISP this responsibility was widened to include local leaders (traditional authorities, community-based organisations, public officers aside from MAL, etc.). Thirdly, FISP was expanded to include rice, sorghum and groundnuts (Mason, *et al.*, 2013:617).

Expenditure rose from ZMK 17.8bn in 2002 (approximately US\$ 4.5m at the time<sup>12</sup>) to a peak of ZMK 895.4bn in 2011 (approximately US\$ 189m). During this period the share of Zambia's agricultural budget going to FISP fluctuated between 10% and 43%. However, after 2011 the amount going to FISP was reduced and stood at ZMK 500bn in 2013 (approximately US\$ 77m) which was 23% of the agricultural budget (Mason, *et al.*, 2013:614).

As in other countries, suppliers are determined through a competitive tender process. Omnia Fertiliser Zambia Ltd and Nyiombo Investments Ltd were awarded the contract every year until 2013. In 2013 the Zambian Competition Commission fined the two companies for bid-rigging and cartelistic practices in relation to FISP, and barred them from supplying fertiliser to the programme in future (Mason, *et al.*,

12. In 2013 the Bank of Zambia rebased the currency so that 1 000 old Zambian kwacha (ZMK) equalled 1 new kwacha. It is difficult to find the exact exchange rate for that time, but we can reasonably work on a rate of around ZMK 4 000:1 in the earlier years of the 2000s, rising to around ZMK 6 500:1 in 2013 [https://en.wikipedia.org/wiki/Zambian\\_kwacha](https://en.wikipedia.org/wiki/Zambian_kwacha).



2013:616). Subsequently five companies—Ultratek, Zambia Fertiliser, Neria Investments and two South African companies, Foskor and Bosveld Phosphates—were awarded tenders to supply raw materials for the programme, although reports indicated significant political interference even after the awarding of the tenders (Daily Nation, 2014).

Fertiliser is imported and transported to main depots in participating districts by suppliers selected by means of a national tender. Once at the main depot the inputs are delivered to satellite depots by contracted local transporters and then distributed to beneficiaries (Mason, *et al.*, 2013:616). Recent shifts aim to include agro-dealers as delivery agents in the contract process, for example through an e-voucher scheme which is being piloted in 2015. Farmers will pay their contributions directly to agro-dealers, who are selected by district agriculture coordinating offices. The agro-dealer then redeems the voucher from government. Theoretically, the e-vouchers allow farmers greater choice about what they buy, instead of simply receiving a standard package of fertiliser and hybrid maize seed. The 2015 Budget acknowledges that FISP needs to be adapted to provide seeds for a variety of crops according to “ecological comparative advantage”, which requires limiting the amount spent on maize as this currently absorbs over two thirds of the entire agricultural budget (Shula, 2015). According to the district commissioner in Chongwe, “we do a survey of what the cooperatives want in terms of seeds. Then we relay this information to the ministry. When it comes time to deliver the inputs we get about five different varieties from the ministry and each cooperative chooses the varieties they want”.<sup>13</sup> However, farmers we spoke to indicated they take what they can get – they may request a certain brand or variety but end up with no options.

Efforts at diversification are a step towards responding to one of the main criticisms of FISP—that it has focused almost exclusively on



Temporary grain storage of hybrid maize waiting for FRA purchase, Chikankata.

maize. There was a sharp increase in average annual maize production following the launch of the input subsidy programme, from an average of 1m tons in the 1990s to 1.2m tons in the 2000s, and 2.9m tons from 2010–2014.<sup>14</sup> While an increase in production may be welcome, there are costs to this exclusive focus on a single crop. It directs farming households towards maize production even in marginal conditions, thus reducing ecological sustainability and ultimately production diversity. Also, it has produced dependency: ““Everyone relies so heavily on those subsidised inputs, they don’t know what to do without them. There is no future if we continue down this current road””.<sup>15</sup>

It may be difficult for government to change course. According to Carl Wahl at Concern: “Government recognises it’s failing in its promotion of only hybrid maize and fertiliser. They know the politicisation of maize is a problem, but it’s a matter of votes and they

13. Interview, Charles Simulundu, District Agricultural Commissioner, Chongwe, 15 July 2015.

14. <http://www.indexmundi.com/agriculture/?country=zm&commodity=corn&graph=production>.

15. Interview, Daniel Kalala, Research Coordinator, Kasisi Organic Agricultural Training Centre, Chongwe, 8 June 2015.

don't know how to get out of it. Everyone knows that subsidising maize and fertiliser, and the purchase of maize, needs to end but they are too afraid to do it. Go to any farmer, all they say is 'we need hybrid seed and fertiliser'. They don't know anything about carbon in the soil, simple local sustainable practices".<sup>16</sup>

A number of other criticisms have been levelled at the programme, including questions about whether the cost of the programme justifies the outcomes; beneficiary criteria which may exclude a large number of poorer farming households that either cannot plant 1 ha of maize, or that cannot afford membership fees to farmers groups or cooperatives; that in practice the programme tends to benefit better-off farming households; that not all farmers receive the full input package; and the standard problem of the late delivery of inputs (World Bank, 2010; Mason, et al., 2013). These criticisms were echoed frequently in interviews with CSOs and farmers. According to Mason, et al., expenditure that goes to FISP might be better utilised on the known pro-poor drivers of agricultural growth, such as R&D, rural roads and infrastructure, electrification, and rural health and education.

### **Output markets and the Food Reserve Agency (FRA)**

Generally speaking, there are two types of markets: local markets within the farming households' sphere of mobility, where someone from the household can be sent to sell; and larger external markets that require coordination and transport, including national and export markets. The latter are usually mediated by traders and processors. The Green Revolution focus is on the latter. The concern is not about local food security. This is especially notable in the emphasis on maize to the exclusion of other crops. Even resource-poor farmers are bound into

markets. According to one of the groups of farmers we interviewed: "We need the market. If there is no market how do I continue?"<sup>17</sup> In another focus group everyone agreed they would grow anything if there was a market,<sup>18</sup> because they require cash to meet household needs, including food purchases. Zambia is no different to the rest of the region's agricultural economies in that many producers are distant from the pockets of demand, transport and storage facilities are poor, and there are gaps in information (e.g. the location and magnitude of current demand). A compounding factor for small-scale farmers is that most households produce the same products in the same area, which results in seasonal gluts. This collapses the price at exactly the time these households need to sell their produce. The production of niche crops, for example fresh produce, carries additional challenges for perishable products—storage and transportation.

Time and again farmers indicate their capacity to produce a range of crops, but must limit their production to what can be consumed at home because of the lack of markets. This is true for most crops, including traditional maize varieties. The only market is for hybrid maize.<sup>19</sup> Farming households tend to be held captive by 'briefcase buyers' who circulate around the farms offering immediate cash for products, but at low prices.<sup>20</sup>

Farmers who tried to produce to organic standards said: "You get a cheap price at the farm gate. There is no stable market for organic produce so we are just getting manipulated by people who follow us to the farm, then we just have to take what price we can get. They don't even disclose where they are taking the organic produce to the market and so you just have to accept the price you get ... The problem is farm gate prices. Normal market prices are given for organic vegetables that are not recognised as

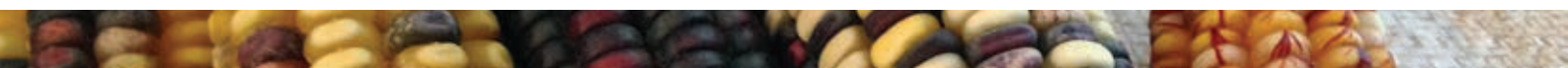
16. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

17. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

18. Focus group 3, Nadezwe farmers, Chikankata district, 16 July 2015

19. Interview, Robson Nyirenda, Training and field extension, Kasisi Agriculture Training Centre, Chongwe, 6 June 2015; Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

20. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015; Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.





different on the local market ...We just have to take what price we can get from agents.”<sup>21</sup>

As we found elsewhere in the region, the flipside to the agricultural input markets that drive the Green Revolution is the expansion of output markets, to absorb the increased production of more standardised products; theoretically they also generate the cash to purchase new inputs for the next season. According to Melanie Wilkinson, Country Director at International Development Enterprises (IDE), an NGO which has worked with AGRA and others in the past (see below for more details), historically the focus of farmer support was on the input side both, from NGOs and the private sector. Wilkinson says: “There is now a huge amount of work that needs to be done on the output side—markets just haven’t caught up yet. The market is a lot thinner on the buyer’s side, there are very few players and they have been slow to respond. There are a lot more businesses on the input supply side, and a lot more competition.”<sup>22</sup>

Government has prioritised the development of output markets, including institutions, financing arrangements, physical infrastructure, farmer support and even guaranteed markets, such as FRA grain purchases (see Box 1). This emphasis occurs across the region, together with the longer term goal of the regional integration of markets (input as well as output). Everywhere, outputs markets are a necessary component of the Green Revolution package.

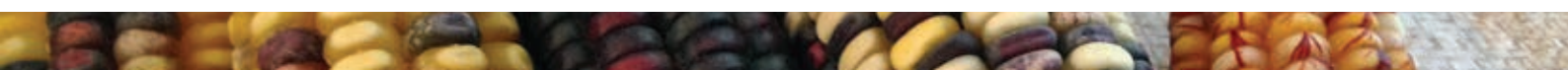
## The Food Reserve Agency (FRA)

The government’s FRA is a key market for smallholder surpluses, especially of maize. The FRA is governed by the Food Reserve Act 20 of 2005 (Government of Zambia, 2005). Its essential functions are to maintain a national strategic food reserve; to engage in the marketing and trading of designated agricultural commodities, including establishing or setting prices where private sector involvement is minimal; and to manage national storage facilities. Each year it must announce its planned purchases of designated commodities for the following marketing year. It can sell reserves to fill local shortfalls and in food emergencies, but only with advance notice of its plans. The FRA buys from registered traders and processors and may establish regulations for these actors. The agency should have representatives among small-scale farmers as well as the Zambian National Farmers’ Union (ZNFU), the Millers’ Association of Zambia, the Bankers’ Association of Zambia, a co-operative, and various government institutions. Although the law refers to designated crops, the FRA has focused almost exclusively on maize (Mason and Myers, 2011:1).

In deficit years, the FRA imports maize and sells it below market prices to large-scale millers (Mason and Meyers, 2011). The agency manages 458 storage facilities with capacity for 2m tons, although capacity for only 1.1m tons is usable, and it is in the process of mobilising funds to rehabilitate and upgrade its facilities. There are some infrastructural issues besides the lack of full storage capacity, and storage facilities do not always align with agricultural production patterns, which have shifted from the south to the north due to changing weather patterns (FRA, 2015). The agency recently accessed a US\$ 11.6m loan from the Chinese government to expand and establish new facilities.

21. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

22. Interview, Melanie Wilkinson, Country Director, International Development Enterprises (IDE), Lusaka, 20 July 2015.



The FRA has purchased an increasing amount of maize from smallholders, reaching a high of 878 570 tons in 2010/11, accounting for an estimated 83% of smallholder sales. It absorbs a significant amount of public resources, at an average 25% of government's total allocation to poverty reduction programmes between 2004 and 2011. The FRA commits to buying maize at above pan-territorial prices and consequently has contributed directly to increasing the amount of land planted to maize. Despite this, there has been a negative effect on maize yields—possibly because newly-planted land is less suited to maize production (Mason *et al.*, 2011).

The issue of farmers not getting paid on time was raised a few times in interviews with CSOs and farmers. As farmers put it: "At the moment the government is actually getting credit from the farmers because it gets that maize and then only pays months after that."<sup>23</sup> Farmers are caught in a bind because they are producing maize that must be sold. One group of farmers told us: "Maize is the only market but FRA only pays in January or February the next year ... those few who take maize to the FRA early get paid quickly but then FRA runs out of money so the rest have to wait to the following year ... Otherwise often are just forced to sell to briefcase buyers, who give money at the beginning of the season, and then take all your harvest at the end. This way you make less money. 50 kg maize is sold to them for K35 or K40 ... The local millers are the same briefcase buyers, they are often the same people."<sup>24</sup>

Assessing the FRA is a challenging question. On the one hand it is a positive move for government to support farmers by buying their surpluses at higher prices than prevailing market prices, and to have a strategic reserve for use when necessary, to

enable people to source the food they need. But there are questions about where support is directed, who benefits, and how the programme builds strength and resilience within the farmer base.

In classic Green Revolution style the intervention is very much built around maize. It appears to be a bit further behind other countries in the region with similar programmes to diversify from maize to include other important crops. According to Robson Nyirenda, KATC Training and Extension Manager: "The driving force for maize is from the market. There is no market development for any of the other crops, in seed or sale."<sup>25</sup>

The narrow marketing focus on maize is detrimental. It puts farmers into a maize dependency trap and is closely related to the policies and practices of the Green Revolution in its most crude and extractive form. Food reserves that cater only for maize will not provide the necessary nutrients, other than calories. Ideally a food reserve should contain a diversity of food products, which means supporting products beyond maize as well as decentralising their storage and management.

Extending support to a wider diversity of crops has been a challenge for other organisations who have tried. According to Rosie Pilcher of the Conservation Farming Unit (CFU) they tried to promote legumes, sun hemp, cowpeas and green gram, amongst others. But, she argues: "These other crops failed largely because there is no market. Farmers aren't likely to grow crops that they can't get a good price for ... The theory of making land healthy does not in practice weigh up against money for legumes ... Market price affects crops grown so the main ones are groundnuts, dry beans, soya beans, and maize."<sup>26</sup>

23. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

24. Focus group 4, Nadezwe farmers, Chikankata district, 16 July 2015.

25. Interview, Robson Nyirenda, Training and field extension, Kasisi Agriculture Training Centre, Chongwe, 6 June 2015.

26. Interview, Rosie Pilcher, general administration, Conservation Farming Unit, 6 July 2015



Public or multilateral agencies tend to dominate commercial purchases, even for other products. Melanie Wilkinson from IDE says: “If you take the example of soya, the World Food Programme (WFP) buys all the soya. So it’s not a private sector buyer. All the buyers in Zambia are selling to WFP—World Vision, NWK,<sup>27</sup> Golden Lay Limited (beyond what they use)—and then of course all the briefcase buyers. So the market then depends on WFP funding, rather than an open commercial market.”<sup>28</sup>

## **USAID, AGRA and other Green Revolution initiatives in Zambia**

This section provides a broad overview of Green Revolution initiatives. (Specific details about seed and soil fertility are addressed within their own sections later.) It appears from an initial scan that major donors to Zambian agriculture include USAID, AGRA and the World Bank, plus the FAO (United Nations), IFAD, and the Scandinavian countries (Finland, Norway, Sweden). There is also some Chinese investment (see, for example, Guo Chatelard, 2014), but since our focus is on AGRA we will concentrate on the ‘old hubs’ of global capital (the US-European Union axis) of which AGRA is a part.

**USAID’s** Zambian projects concentrate on the agricultural sector, health issues, HIV/AIDS awareness and treatment, basic education and democratic governance (USAID, 2015). USAID supports the implementation of the CAADP Compact as it will create an enabling environment for private sector investment. USAID focuses on: addressing policy and regulatory issues related to agriculture; natural resource management; identifying trade opportunities, issues and constraints; and developing a supportive policy and regulatory environment for agriculture. See Table 1 for USAID’s current food security programmes in Zambia.

USAID also works in partnership with, among others, Finland, Norway and FAO to scale up CA. These efforts include: a public-private

partnership (PPP) involving the Norwegian Embassy, to link smallholders to processing markets for soya beans and groundnuts; co-funding with the Embassy of Sweden on policy analysis and advocacy reform work; and, with Irish Aid, UKAID and the United Nations Children’s Fund (UNICEF) to support Zambia as an Early Riser under the Scaling Up Nutrition (SUN) movement (FtF, 2011). USAID also supports several other US-government sponsored initiatives in Zambia, including the FtF initiative and SATH.

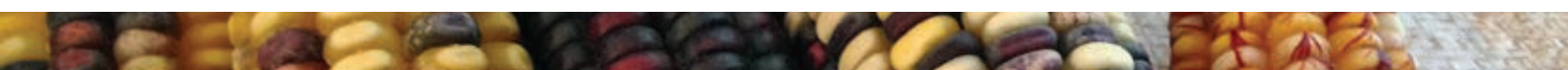
The FtF initiative, under the auspices of USAID, focuses on value chains, policy and nutrition (particularly household). It aims to diversify staple food production through increasing the production, marketing and consumption of high-nutrition crops, including orange-flesh sweet potatoes and Vitamin A-rich orange maize. The programmes are concentrated in the Lusaka-Eastern Province corridor, which links to the Nacala Corridor in Mozambique via Lilongwe in Malawi. The programme targets 200 000 smallholder households (USAID, 2015). We would need to conduct a ground truthing exercise to see what is happening in practice.

The SATH is a regional institution which aims to support the expansion of intra-regional trade and to increase the international competitiveness of agribusinesses. It focuses on customs regulations, modernisation, food production, renewable energy, trade facilitation and WTO compliance, among other areas. Supported by USAID, the Trade Hub works closely with the Southern African Development Community (SADC). In Zambia its projects focus on improving storage quality to reduce post-harvest losses, reducing the time and cost of releasing traded goods, and improving the development of and access to standards and technical regulations (SATH, 2015).

It provides training on national grain grading and standards, warehouse management and pest control (SATH, 2015) and supported Zambia’s first outdoor event in 2014, the Agritech Expo, in partnership with the ZNFU.

27. NWK Agri-Services, Lusaka, Zambia.

28. Interview, Melanie Wilkinson, Country Director, IDE, Lusaka, 20 July 2015



**Table 1: USAID current food security programmes in Zambia**

Programme	Duration	Targeted reach	Partners	USAID investment	Activities
Better Life Alliance	2011–2015	40 000 households	Public-private partnership	US\$ 6.6m	Agricultural extension services, provides access to inputs, trains in conservation farming
Commercial Agribusiness for Sustainable Horticulture Program	2012–2016	5 000 smallholder producers and processors	Agribusiness in Sustainable Natural African Plant Products	US\$ 4.8m	Provides access to inputs and irrigation, supports production and marketing of horticultural products
Food Security Research Project III	2010–2015	Zambian research institutions and government	Michigan State University	US\$ 12.5m	Builds capacity in local research institutions and government to collect and analyse data
Development Credit Authority Agreement	2012–2018	Individuals and small businesses	Zambia National Commercial Bank, Swedish International Development Agency	Variable, dependent on financing	Supports credit access for individuals and small businesses in the agricultural sector
MAWA	2012–2017	21 500 poor rural households	Catholic Relief Services	US\$ 10m	Links farming households to value chains, invests in health systems
Production, Finance and Technology	2012–2016	800 000 people, increase value of agricultural sales by US\$ 125m	ACDI/VOCA	US\$ 24m	Disseminates improved productivity technologies, develops value-chain finance schemes, develops export strategy, capacity and governance of cooperatives
Zambia Agriculture Research and Development	2011–2015		Consultative Group for International Agricultural Research (CGIAR)	US\$ 18m	Builds research capacity of the national system, bolsters agricultural management systems for higher yields, improved nutrition and environmental sustainability

Source: USAID, 2015.

It has also sponsored a technical workshop at which 500 farmers were trained in financial management and best practices for soil quality, mechanisation, increasing yields and sustainability, and supports the upgrading and accreditation of testing services in commercial laboratories (USAID, 2015).

SATH has supported and co-financed the launch of the South African National Seed Association (SANSOR), a market intelligence platform to enable seed companies to make better investment decisions regarding what seeds to buy for target markets, and it supports the development and expansion of structured trade platforms and warehouse receipting in Zambia.





**AGRA** has disbursed 24 grants in Zambia at a total cost of US\$ 12.37m between 2007 and 2014. These grants apply to a total of 673 projects costing US\$ 386m in all its focus countries during this period (AGRA, 2015). In Zambia AGRA provided grants of US\$ 8.76m between 2007 and 2012 (after which AGRA stopped publishing grants information on its website), which suggests that difference of US\$ 3.61m was granted in 2013 and 2014. There were 17 grants until 2012, and another 7 grants until 2014. Overall amounts to Zambia are significantly smaller than to neighbouring Tanzania, at just 16% of the value of AGRA grants to Tanzania in the period 2007–2012. This is indicative of Tanzania’s priority breadbasket status.

Until 2012, the AGRA’s seed programme, PASS, was allocated around 61% of the total value of grants in Zambia, followed by the SHP (22%) and then other grants—PPP Investments and Markets (17%) (see Appendix 2 for details). The ADP received the largest share of the PASS grants (63%) with the majority of this going to CARE for the extension of an agro-dealer network, between 2008 and 2011. Government institutions (ZARI and the SCCI) and the UNZA received 20% of PASS grants by value. More detail on grants to the seed programme are indicated in the seed section below. The programme for soil health is a smaller share of total AGRA grants in comparison with other countries we have studied during our research programme,<sup>29</sup> perhaps because synthetic fertiliser use is already well entrenched in Zambia, especially through FISP. ZARI and UNZA received all the grants allocated to the SHP, bringing the grant value to public sector institutions and the university to 34% of the total. More details on SHP grants are provided in the section on soil fertility below.

Zambia is also part of a **World Bank** Agricultural Productivity Program for Southern Africa (APPSA) along with Malawi and Mozambique. The programme has a total commitment of US\$ 90m which will cover the period 2013–2020. It focuses on Green Revolution

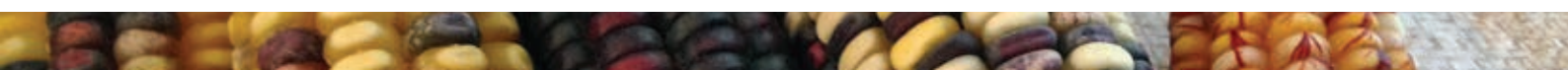
technology generation and dissemination among small-scale farmers in the three countries, including the establishment of regional centres of leadership. The programme targets 93 new technologies in maize, rice and legumes, and aims to reach 6.1m farmers by the end of the project. Areas of research include nutrition, human health, food safety, mitigating the effects of climate variability (including CA and drought tolerant maize and legumes), crop diversification and commercialisation, agro-processing and value adding, post-harvest storage, new diseases, and pest and disease resistant varieties. R&D builds on CGIAR work and supports the strengthening of national agricultural research systems with an emphasis on the public sector (World Bank, 2015). APPSA is facilitated by the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA), which works with ZARI and GART in Zambia (*Lusaka Times*, 2013). Implementation has been slow; there are no results to date although major risks have been identified—institutional capacity for implementation, and fiduciary risks. Zambia had received 22% of its allocated funds by the first half of 2015, although an actual figure has not been provided (World Bank, 2015).

Charles Nkhoma, Director at CTD, <sup>30</sup> is critical of the way these initiatives select farmers for support:

*Programmes like AGRA just say, we want to provide free seed, or free inputs, can you find us the farmers that will produce well. These programmes always want to pick on those good farmers, because they want their projects to look good. They start already on a higher level. So also this means they target the farmers who aren’t the ones who need the support. But they are instead the ones that make whatever programme is being promoted automatically look good. However it’s actually the farmers themselves who are just good farmers, not because the programme is making them into good farmers. Some farmers don’t need support,*

29. E.g. 60% in Tanzania; 34% in Mozambique.

30. Interview, Charles Nkhoma, Director, CTD, Lusaka, 10 June 2015.



*they do OK on their own and these are the ones that are targeted. I know AGRA does that, because otherwise many of our farmers we work with would have been AGRA farmers, but they are too poor. Their method of targeting is probably the opposite of ours, we work with the farmers who are the most resource constrained. But we are not a charitable organisation, we don't give things out for free.*

## **Agrodealers, extension services, and transfer of technology**

A critical aspect of input supply is delivery channels. Developing new technologies are of little use if these cannot be transferred to farmers. Historically delivery and advice was conducted by the public sector extension service, but this facility was denuded with structural adjustment and the consequent neglect of investment in agriculture. Although public extension services continue to play a role, the model of technology dissemination and advice favoured by Green Revolution methodology is private enterprise with support for the establishment of agro-dealers as profit-making businesses. This is the same in other countries in the region. By 2012 there were nearly 1 500 retail shops licensed to sell seed in Zambia (World Bank, 2012). The share of households purchasing fertilisers from private dealers increased from 15.4% in 1999 to 24.4% in 2011 (Mason et al., 2013:619).

There are various different methodologies and they are all used—demo plots, farmer field schools, lead farmers working with a group of farmers. The methodologies themselves are valid but they can be used for many different purposes. As ACB has discussed in other reports produced for this research programme, Green Revolution initiatives still tend to adopt a 'transfer-of-technology' approach to extension. In such cases, the technologies are developed elsewhere and often are driven by competition for market share in boardrooms on another continent, and then local farmers must be convinced to use them. This model is

quite different from one where farmers work closely with extension and R&D to identify their own issues and priorities, based on their own experiences, which then become part of the experimentation and resolution in partnership with extension and R&D. Of course, these are not absolutely exclusive. New technologies increase the options available to farmers but there is a problem when the channels of distribution plug a single method and approach only, especially where these are sponsored and subsidised by both the private and public sectors.

AGRA's ADP is designed along the lines of private sector businesses. AGRA provided grants of US\$ 3.38m to CARE and Nutri-Aid Trust (NAT) to develop agro-dealer networks in Zambia between 2008 and 2013 (see Box 2). IDE received a small grant from AGRA for seed work, and IDE's Farmer Business Advisor (FBA) model was adopted by Profit Plus for its agro-dealer networks (see case study in Box 3 in seed section below).

### **Case study: Nutri-Aid Trust**

NAT was given an AGRA grant by PASS of US\$ 328 000 for 2011–13, for agro-dealer development in Zambia. The project is managed by CARE Zambia while NAT works with association-based small and medium enterprises (SMEs) to commercialise their businesses. Associations include the Mumbwa District Farmers Association, Mansa District Business Association and nine district agro-dealer associations (Nutri-Aid Trust, 2015). The Trust also receives funds from IDE for the Wealth Creation through Irrigation (WIN) project; the European Union (EU) and the Netherlands Development Organisation (SNV), to provide agricultural inputs and extension services by creating and training agro-dealers; and an alliance between USAID, the Bill and Melinda Gates Foundation, the Swedish Foreign Ministry and AGRA, as part of the FtF initiative. The Trust also sells hybrid maize seeds, agro-chemicals, and farm tools.



Peter Manda, Director of NAT<sup>31</sup> says they started with AGRA in 2009. There are lookalike organisations in Kenya (AgMark) and Malawi (RuMark) with whom AGRA works in the same way as with NAT in Zambia. New organisations similar to NAT are being initiated through AGRA's work in Mozambique, Tanzania and elsewhere. NAT was started as a private consultancy business and engaged in an early consultation with CARE International, regarding their agro-dealer extension survey in Zambia. But CARE's primary focus was not on agro-dealers, and AGRA was changing its focus to fund local NGOs instead of internationals. Consequently NAT transformed itself from a private business into a locally registered NGO, in order to work with AGRA as a development organisation.

NAT's key role is as an agro-dealer development organisation with a focus on facilitating the supply of high quality inputs from the private sector. Manda indicates there are weaknesses with private sector activity as it stands. First, their activities are mostly confined to main transport routes, and secondly, they restrict themselves to the most profitable sites. As a result, smallholder farmers continue to travel an average of 70 km to access inputs. NAT's role is to push this access through supporting the extension of private sector supply into deeper rural areas, by training local people to become agro-dealers. NAT targets what Manda refers to as the more astute people in the community, those who are shrewd and who perhaps have more money. The private sector is not interested in training people; it does not have the money or the patience and so NGOs are stepping in to fill this gap.

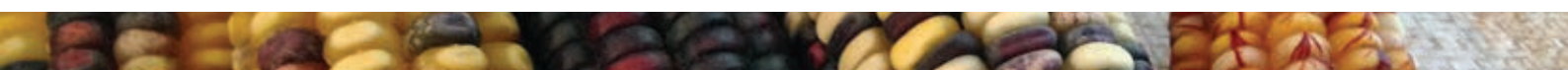
NAT begins its work in a community where there is a demand for training, with a minimum cohort of 25 individuals. First it provides three days of business skills training: "how the shop should look,

branding, customer care, book keeping, receipts, banking". Dealers are trained to run 'four corner shops' with seeds, agro-chemicals, fertilisers, and small implements and machinery, the idea being that they stock products that are demanded by farmers. After this initial training NAT provides mentoring in technical skills and financial literacy. NAT holds competitions for the best shop and agro-dealer, with regional trips as prizes which are sponsored by the Common Market for Eastern and Southern Africa (COMESA) and the African Fertiliser and Agribusiness Partnership (AFAP), which was established with funds from AFRA.

NAT facilitates the initial connection between the dealer and the private sector suppliers, but thereafter it is up to the dealer to develop the relationship and negotiate supply arrangements. From here matters are basically left to market forces. Essentially this makes it easier for the private sector seed and chemical companies to reach a wider audience without having to foot the bill— "clearing the road for private companies" in Manda's words. The agro-dealers generally receive the product in bulk and then package it on site for supply to farmers.

The idea is that agro-dealers should work with both input and output private sector companies to ensure they have consistent business throughout the year. So before planting they sell inputs, and at harvest they aggregate farmers' products for sale into larger markets. There are also efforts to get the agro-dealers to perform financial services which may be relevant at any stage during the year, for example, through links with Airtel, banks and micro-lending institutions. NAT facilitates interactions between the dealers and financial institutions for training, but does not provide the training itself. Dealers may engage in value chain financing, providing credit for inputs up front and then deducting costs on receipt of the harvest. This encourages acceptance of the new technologies.

31. Interview, Peter Manda, Director, Nutri-Aid Trust, Lusaka, 14 July 2015. All information in the case study comes from this interview unless otherwise indicated.



Agro-dealers are encouraged to establish demo plots next to their shops. Part of the training, organised by NAT but outsourced to private companies, is how to create a demo plot. Seed from each of the seed companies is planted in the demo plot so that farmers get to know the different varieties and what it is they are buying. Usually each seed company will have two varieties each year. At farmer field days, private companies are invited to come and talk to farmers.

There are many similar initiatives taking place across Zambia. Noteworthy due to its scale and the support it receives from AGRA is Production, Finance and Improved Technology Plus (PROFIT+). This programme follows an earlier iteration called PROFIT, with core sponsorship from USAID. The original initiative was started in 2005 and continued until 2010. Not unexpectedly, the emphasis is on private sector led development, utilising an agent network model for the provision of inputs and services to farmers. In this model agents take prepayments from farmers for inputs, consolidate the orders and send them to supplier representatives in the towns. In the first phase 600 agents were linked to 14 suppliers of chemicals, fertilisers, seed, and animal medication, and connected with an estimated 100 000 farmers. There was also some degree of sub-contracting amongst agents; this was considered a positive development by the evaluators because it enabled wider reach. One of the lessons drawn from the first phase was that inputs are a key component of value chains “and should not be treated as public goods”. The evaluators argued that the input subsidy programme had long term detrimental effects on the sustainable uptake of Green Revolution technologies (Development Alternatives Incorporated (DAI), 2010).

In 2012 the second phase, PROFIT+, was launched. The contract, valued at US\$ 24m, to manage the programme was awarded to ACIDI/VOCA,<sup>32</sup> another of those ever-present US consultancies that plays a major role in implementing US-supported Green Revolution projects in Africa. According to Charles Simulundu, District Agricultural Commissioner at Chongwe,<sup>33</sup> the programme teaches farmers to produce high value crops including soya, groundnuts, tomatoes and onions. ACIDI/VOCA trains farmers on the whole value chain, from nursery production to marketing. It supports production training on specific high-value crops (including chemical spraying and fertiliser handling and use), links farmers to markets, assists in negotiating contracts, makes connections to agro-dealers and links producers to micro-finance institutions. Robson Nyirenda at Kasisi commented: “These ones [PROFIT+] are all into the herbicides, they promote marketing of vegetables but it is with a lot of chemical inputs.”<sup>34</sup>

PROFIT+ uses a farmer business advisor (FBA) model based developed by IDE. A lead farmer is supported with all the technology free of charge, and each lead farmer trains a group of 15 other farmers, who must self-finance purchase of new equipment. Micro-financing is provided on a group loan basis. Simulundu says that although a few farmers have reached the Lusaka market, farmers remain disorganised and cannot access larger commercial contracts.<sup>35</sup> According to Kenneth Chileshe, programme coordinator at IDE,<sup>36</sup> although PROFIT+ is using the FBA model developed by IDE, PROFIT+, “are very big on giving things for free, and IDE doesn’t do that”. PROFIT+ have used the IDE FBA model but have adapted it and are not meant to be calling it by that name anymore.

Ultimately these agro-dealer networks, who are subsidised not by private corporations but by governments and other donors, benefit the corporations, and the corporations need not

32. <http://acdivoca.org/who-we-are>.

33. Interview, Charles Simulundu, District Agricultural Commissioner, Chongwe, 15 July 2015.

34. Interview, Robson Nyirenda, Training and field extension, Kasisi Agriculture Training Centre, Chongwe, 6 June 2015.

35. Interview, Charles Simulundu, District Agricultural Commissioner, Chongwe, 15 July 2015.

36. Interview, Kenneth Chileshe, Programmes Coordinator, IDE, 22 July 2015.





be explicitly promoted. However, the logic of support is more important, as Vince Hodson, Technical Advisor at CFU<sup>37</sup> explains:

*Three seasons ago, the MRI, a private for-profit enterprise, said their sales of products to small scale farmers had increased sevenfold, 700%. And now it's another three seasons on. So it's a big market, and becoming a big market for everyone else ... We have increased their sales by X amount, not only herbicides, but hoes, planting machines, the whole conservation farming range. We have done all of that on the back of funding from the Norwegians. They are now making a whole lot more money from what we do. We don't actively promote their products but we promote an agricultural system, which obviously involves their products.*

*Three seasons ago we moved into a lot of new areas. Lead farmers left behind know a lot about farming and products, and so the MRI took them over and trained them to run their own businesses and become extension officers for them. Not for nothing; they gave them loans, the promise of a container in the future where they can sell all the conservation farming range ... We don't promote agro-dealers but because we promote tools, and we will promote certain tools over others because they are better, so indirectly we have grown their sales.*

## SEED

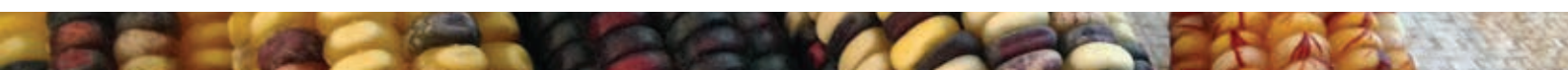
As with most African countries, Zambia has a dualistic seed system with a small, highly formalised commercial sector focused on maize, and a much bigger, unsupported farmer-managed sector that produces most of the remainder of the seed. There is also an intermediary sector in Zambia that produces seed for food security and market purposes, which relies on civil society support (ISSD Africa, 2013).

This section starts with a consideration of the primary challenge, defined as farmer access to quality seed. Here we try to unpack aspects of 'quality'. We then turn to a brief description of the farmer-managed seed system which remains the broad base of seed production (apart from hybrid maize), as it is everywhere else on the continent, except for South Africa. Then we provide a brief background to the formation of the commercial seed sector, unsurprisingly built around hybrid maize which helped to reduce the cost of maize as a staple for mine workers in the colonial era. After that, the section looks at the current seed policy and legal framework, the role of the public sector in R&D and production, the role of the private sector, and efforts to bring small-scale farmers into seed production, before concluding with a few reflections on the seed sector in Zambia and the Green Revolution.

### **The challenge: Farmer access to quality seed**

The mainstream definition of quality seed is based on formal processes of certification, which in turn are based on a set of uniform standards looking at issues such as germination, purity, disease-free and moisture content, as well as agro-ecological applicability. While these are useful standards, there are a number of weaknesses with the ways in which they are managed. First, the formal regulatory system insists that seed must be tested at an accredited station, but this places the process out of reach of most farmers.

37. Interview, Vince Hodson, Senior staff and technical advisor, Conservation Farming Unit, 6 June 2015.





OPV maize cobs, Chikankata

Secondly, and most importantly, the formal regulatory system assumes that any seed that has not been through the formal certification system is automatically of poor quality. This is evidently not true, since farmers regularly rate recycled and locally shared seed as being of good quality. This suggests the need for the development of systems to enable seed producers and users (with farmers being on both sides of the relationship) to develop and deploy accepted ways of measuring quality within their locality, rather than having to rely on costly and inaccessible external expertise. This is the basis of participatory guarantee systems that already operate in pockets throughout the continent, and beyond.

This is not to say that traditional varieties and farmer-saved seed are perfect. There are plenty of cases of limited availability and restricted choice, attested to by farmers and other actors in the seed system. Charles Nkhoma of CTDI says: “We find that the communities who tend to be poorer would usually be more reliant on their own varieties, on traditional maize and other crop varieties. But they do not always have access to these seeds anymore. This is causing a huge problem for them because under normal circumstances, when you

don’t have the money and the commercial varieties, you fall back on traditional varieties. But in some areas the quantities available of traditional varieties are now a major limiting factor.”<sup>38</sup>

According to farmers:

*You have to fight hard to find Gankata<sup>39</sup> seed because people don’t buy it. Everyone who grows it just keeps it for themselves, they just save enough for their own seed for next year. But if more people start to grow Gankata then us who grow it already will keep more seed to sell, because we know there will be a market. Right now we just keep enough for the following season for ourselves. The rest we will just sell together with the hybrid maize after we have put aside for the household.*<sup>40</sup>

Almekinders and Louwaars (1999), and many others subsequently, have made a solid case that varieties that are isolated for too long can lose vigour and can be beset by diseases that are difficult to eradicate because they are propagated anew each season. Bringing fresh genetic material and varieties with different traits into a local supply base can have a positive impact, potentially enhancing local varieties. This idea is the basis of Integrated Seed Sector Development (ISSD) which, as the name implies, seeks to integrate the best of local or farmer-managed seed systems and varieties with commercial seed systems. Unfortunately, ISSD—which emerged from the Dutch, in particular at Wageningen University—tends to rest on the idea that the best way to achieve an integrated mix that will produce quality seed, is through the private commercialisation of plant breeding and production.

There are also problems with the quality of certified seed. Certification does not guarantee quality, and because the supply chain is long (from R&D, through basic seed production, through bulking up and multiplication,

38. Interview, Charles Nkhoma, Director, CTDI, Lusaka, 10 June 2015.

39. Gankata is a popular local maize variety

40. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.



through agro-dealers and other distributors) before the seed reaches the farmer, there are many places for quality to decay. Also, much is being made recently about ‘fake’ or ‘counterfeit’ seed. A sceptical attitude towards these claims may be required, especially since counterfeit can mean simply that someone is producing seed that someone else claims as their exclusive intellectual property. There appear to be problems with some certified seed not performing as claimed. Whether this is a result of uncertified reproduction or can be traced to other flaws elsewhere in the chain is a question for empirical investigation. Farmers are also suspicious of agro-dealers and other middlemen who may repackage and sell expired seed. These issues regarding quality control are present even within the formal system.

But even when the seed is what the label claims it is, it may not be appropriate to the local context. In particular, most certified seed is unlikely to live up to its ‘genetic potential’ (e.g. a yield of 4t/ha) in the context of its real use in resource-constrained conditions. Improved certified seed generally requires generous applications of fertiliser and a consistent water supply (mainly in the form of irrigation) in order to perform. Demo plots usually operate in ideal conditions with all the required inputs being easily available. It is difficult for most farmers to reproduce these conditions on their own plots. Finally, however good certified seed may be, if this is to become the preferred route it will be necessary to address the major problem of the limited range of certified seed available. As can be seen clearly below (reinforced by major government input and buying programmes, as indicated above) the focus is almost exclusively on maize.

Carl Wahl, Conservation Agriculture Coordinator at Concern Zambia, said:

*Farmers have no problem getting hybrid maize seed or soya. Perhaps they can get certified groundnuts but everything else is a struggle. There isn't the commercial seed*

*market that produces them. Some seed companies may also do a hybrid sorghum variety but it requires so much synthetic fertiliser it's completely inappropriate for small scale farmers, same as sunflowers. We don't want to give seed to farmers that then turns out to be either not locally suitable or bad quality. One of the biggest areas of advocacy work is around better access to seed, including OPVs [open pollinated varieties]—rather than merely maize.<sup>41</sup>*

People cannot live on maize alone. There are many other nutrients required for a healthy life and this requires a diversity of crops. Support is needed for these but demand is often—or even mainly—in localised pockets for socio-ecologically specific seeds and varieties. This discourages MNCs and national-level seed companies who need economies of scale and standardisation, in order to make the profits they require to survive. They cannot adequately serve many small markets for many context-specific products; only a decentralised production system can respond adequately to the demands of farmers.

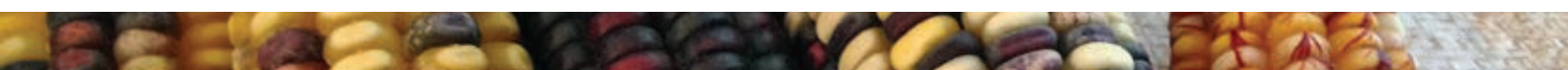
Carl Wahl has commented further:

*We can get seed from SCCI, but this is from guys that are certified in Chipata or something. There is no functioning seed certification and research station in Western province. If you want a bean that, say, can grow in the sand here, you need to trial it in a number of different places, and teach people how to grow it. People would grow a greater variety of crops if they could access locally appropriate seed—but they have to see it growing, they have to see it working locally and [see] the benefits of it.<sup>42</sup>*

Comments by farmers and CSOs indicate that the farmer-managed and commercial seed systems are intertwined, although this relationship is unbalanced. The strong support for hybrid maize results in farmers moving away from local varieties, and it also results in

41. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

42. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.







Pulses and legumes, Chikankata

the displacement of other crops. According to Charles Nkhoma:

*Historically there was much more reliance on sorghum than on maize. And that crop I believe used to be a lot better in terms of consistency in yields and thus seeds. Now with the dominance of maize, people still do have some local varieties of maize but I get the feeling they don't have much in terms of seed, and have lost most of their sorghum ... The drive towards commercialisation makes farmers stop growing things they don't see monetary benefits in, at least in the short term. Farmers are inclined, or prepared to grow what crops will bring them the most profit.<sup>43</sup>*

There are various reasons for the selection of different varieties, even of maize. Yield is a key issue but it is not simply that hybrids produce higher yields; there is also contextual variation, e.g. in some areas local varieties are considered to handle drought better, while in other areas hybrids do better. One group of farmers said

that Gankata had to be planted earlier as it required more water than commercial varieties. They said if there is a dry spell, it is advisable to plant Gankata where the soil fertility is better, where there is more organic matter in the soil that can hold the water better.<sup>44</sup> On the other hand, a different group of farmers said that Gankata does better in drought than hybrid varieties.<sup>45</sup> KATC says that Gankata outperforms short duration varieties in late planted short season years, although it can reach better potential over a long season. The farmers always say they do not use fertilizer with Gankata.<sup>i</sup>

Performance is therefore context specific, and yield depends on many factors, not only the variety of seed. Farmers indicated that other farmer-managed maize varieties, such as Kanjelenjeri and Tandanzara, performed well under their specific conditions. Farmers stressed the importance of planting multiple traditional varieties and a commercial hybrid crop to ensure diversity in case of bad rainfall; where one variety may fail, another may survive. "It depends from area to area, some areas have better soil fertility and so the drought doesn't affect the crops so badly."<sup>46</sup>

Farmers indicated also that yield is an important consideration in selecting varieties to plant, saying they preferred Gankata for their own consumption. They said: "There is just that feeling that the other seeds, the Zamseed and those others, they are meant to be sold, they are not meant for eating. You just get that feeling that when you use those chemicals—the fertilisers—that it's not meant for eating."<sup>47</sup> Farmers highlighted other traits such as density, nutrient density, taste, storability, pest resistance, recyclability ("Gankata seed it's for life") and miller preferences.<sup>48</sup>

In this context, quality becomes a more complex issue, with diversity a key consideration, requiring the availability of

43. Interview, Charles Nkhoma, Director, CTDI, Lusaka, 10 June 2015.

44. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

45. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

46. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

47. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

48. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

i. Personal communications, Bridget O'Connor, 4 December 2015



diverse varieties. As the system is structured now, it comprises a combination of the marginalisation of traditional varieties, coupled with the restricted availability of certified varieties—these elements are displacing crop diversity and replacing it with monoculture.

### Farmer-managed seed systems

Farmer-managed seed systems—those in which the farmer is integrally involved in selecting, producing, exchanging and adapting seed—differ from seed systems in the formal sector in the following ways (seedsystem.org, 2014):

- They are organised at a local level
  - They tend to be integrated into farming practices, as opposed to being a discrete activity
  - They encompass the local knowledge and experience of farmers
  - They produce reliable and locally adapted seed
  - They ensure that seed is available at the right time and in the right amounts
  - They fulfil seed security criteria
- Seed quality assurance is based on trust, local knowledge and observation throughout the growing season

Farmer-managed seed production, multiplication and distribution is predominant for all crops except maize. Farmers tend to use farm-saved seed for self-pollinating crops and rarely purchase seed. All farmer-based seed systems will have some form of seed bank, whether individual or collective. Community seed banks play multiple roles, including the preservation of genetic material and improvement of seed availability; they also play a vital role in the preservation of crop diversity for future generations (Development Fund, 2011). Having access to a range of seeds at the right time can make the difference between hunger and survival for a community. It also provides farmers with a measure of independence, given that they are not totally

reliant on outside sources of seed, which may not be available when needed.

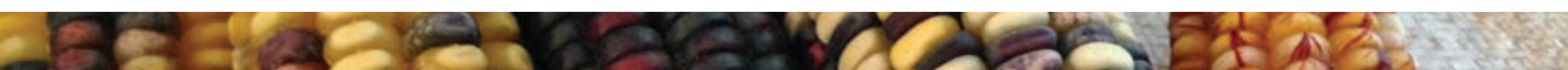
Of the approximately 100 crops cultivated in Zambia about 15% are indigenous (sorghum, millet, cowpeas, bambara groundnuts, sesame and traditional vegetables) and the balance comprise exotic species, of which about 7% have been indigenised (maize, beans, groundnuts, cassava, sweet potatoes, mangoes and avocados) (FAO Commission on Genetic Resources for Food and Agriculture (CGRFA), 2008). According to Susan Chilala of the Rural Women's Assembly (RWA) in Zambia:

*Most of the indigenous crops here can thrive with climate change because of the diversity, and the indigenous knowledge, you know you have to plant early, plant with the knowledge you have traditionally ... Of late we see most people are not taking traditional knowledge seriously. Because this other side has free things to offer and this push all the time for commercial crops is better. So promoting the indigenous knowledge and seed is becoming a problem. People are told their local knowledge and local farming is not good enough anymore.<sup>49</sup>*

Genetic erosion, including of wild species that may be important in a changing climate, is occurring relatively rapidly in Zambia. The expansion of maize in particular is one of the primary driving factors behind this erosion. Government-led initiatives, in collaboration with the SADC Plant Genetic Resources Centre and the Biodiversity Community Network (BCN), have attempted to preserve and multiply farmers' varieties in particular. Pilot schemes are being run at the community level in Lusaka and the Southern province (FAO CGRFA, 2008).

Farmer-managed seed systems are based on experimentation, which includes recycling hybrids and other certified seeds. Robson Nyirenda at Kasisi says he has heard of farmers who mix the hybrid recycled seed and Gankata

49. Interview, Susan Chilala, Secretary, Rural Women's Assembly (RWA) Zambia, Lusaka, 11 June 2015.



seed, and then plant it together for cross pollination.<sup>50</sup> Traditional methods of seed storage include the use of charcoal ash and storing above the fireplace to deter pests.<sup>51</sup> Farmers say ash does not work as well for the hybrid varieties and they have to purchase chemicals. Women are the people who select and save seed, and who maintain local varieties through replanting.<sup>52</sup>

### **Brief historical background to the formal seed sector**

Commercial farming in colonial Zambia was oriented towards the production of cheap maize, to feed mine workers, and horticultural and cash crops for export (Minot et al., 2007). Public R&D was developed to serve this sector. Government began exploring the potential of small-scale farming in the 1970s, following the collapse of copper prices, and public institutions began to develop and release a broad range of improved OPVs and hybrids, especially in maize. By 1992 most farmers, small- to large-scale, were planting hybrid maize, even if it was recycled seed (Minot et al., 2007).

The return on investment from public research into maize seed was negative between 1987 and 1991, with marketing costs soaking up close to 60% of the budget, extension services taking up 38% and seed investments only 3% (Minot et al., 2007). Funding for public R&D declined in the period of structural adjustment and liberalisation after 1992. While government renewed its commitment to R&D in the late 2000s, the budget has not reached 1970s levels of investment (Minot et al., 2007).

The local commercial seed sector was and remains highly dependent on public research institutions, such as the ones profiled below, for access to improved varieties. The commercial sector comprises national and international seed companies that test varieties, provide basic seed, produce

seed (including through outgrowers), plan seed production, provide training in seed production practices and crop management, provide seed quality control, process and store seed, and disseminate and sell seed (ISSD Africa, 2012). Commercial seed breeding and multiplication is either from local stock through contract farming, or from seed purchased from international companies (ISSD Africa, 2012). Seed is distributed through agro-dealers who buy at wholesale prices and who may be provided with training regarding the characteristics of the seed. Companies pay transport costs for seed to stockists plus predetermined commissions on sales (ISSD Africa, 2013).

### **Legal and policy framework**

The Plant Breeders' Rights Act 18 of 2007 (Government of Zambia, 2007) provides for the protection of PBRs and the registration of plant varieties. The SCCI in the Ministry of Agriculture is designated the PVP authority responsible for the implementation, regulation and enforcement of PBRs. PBRs extend to the protection of 'essentially derived' varieties that bear the same essential characteristics as protected varieties. Section 8 of the Act allows for exemptions to the PBRs. In this section any person is allowed propagate, grow or use any plant for non-commercial purposes; sell the plant or propagating material within the farm or place where it is grown; use the protected variety for further breeding, research or teaching; and farmers may save, exchange or use seed for reuse on their own farms. Essentially this covers a good portion of farmers' rights but it does not allow farmers to produce seed for commercial sale without a licensing agreement with the PBR holder. Farmers' rights are defined as the right of farmers to produce, reuse, exchange or sell any seed in their possession. These rights are recognised in the International Treaty on Plant Genetic Resources for Agriculture (ITPGRA) as essential for the maintenance of agricultural

50. Interview, Robson Nyirenda, Training and field extension, KATC, Chongwe, 6 June 2015.

51. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015; Focus group 3, Nadezwe farmers, Chikankata district, 16 July 2015.

52. Interview, Susan Chilala, Secretary, Rural Women's Association (RWA) Zambia, Lusaka, 11 June 2015.



biodiversity.<sup>53</sup> Zambia ratified this Treaty in 2006 and is therefore obliged to integrate its terms into national laws.

Sections 12 and 13 of the Act deal with the extent of rights granted. PBRs cover a period of 20 years for annual crops and 25 years for trees or other perennials. The SCCI may subject PBRs to conditions in the public interest, including food security, health, biological diversity, and other requirements of the farming community, or where problems with competitive practices are identified; such restrictions are subject to appeal by the rights holder. The SCCI may convert rights into non-exclusive rights. PBRs do not extend to harvested materials.

The SCCI may carry out trials to determine whether a variety is distinct, uniform and stable (DUS), and whether these characteristics will be exhibited when the variety is grown in Zambia (s25). Assessment criteria for trials must include “important economic, physiological, ecological and nutritive quality attributes” (s26.3). The SCCI shall refer genetically modified (GM) varieties to the National Biosafety Authority and the provisions of the Biosafety Act 10 of 2007 shall apply to the variety (s26.5). Section 29.7 says no variety that involves technology that is injurious to the life and health of humans, animals or plants shall be registered. Applications from outside the country must be subject to valid multi-locational variety trials for at least three growing seasons to demonstrate its claimed characteristics (s27). This section is under direct threat as a result of the passing of the Arusha PVP Protocol in July 2015, should the Zambian government choose to ratify this Protocol. Regulations passed in 2011 enabled the SCCI to begin accepting and processing PBRs.<sup>54</sup>

Effectively, the Arusha PVP Protocol allocates to the ARIPO Secretariat full authority to take decisions on matters that should be the prerogative of the government of Zambia. For example, if the Zambian government wants to issue a compulsory license in the public interest (Article 24 of the Protocol), the

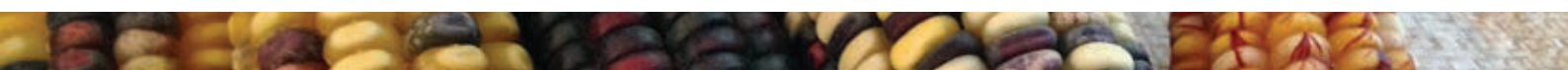
government will have to ask the permission of the ARIPO Secretariat. The ARIPO Secretariat must “consult” the Administrative Council but the final decision rests with the ARIPO Secretariat—in effect, Zambia’s national interest would very much depend on the whims of the ARIPO Secretariat. Essentially, what the Protocol proposes is that the ARIPO Secretariat will have “supranational” powers, i.e. full and total control over all matters concerning PVP in the ARIPO region, while Zambia and other ARIPO member states will have only a marginal role in any decision-making.

Once a variety is registered it must go through a certification and testing process which is mandatory for major field crops. Only seed of regulated varieties can be produced for sale (Minot et al., 2007). It must be noted that this kind of testing on a national level focuses on yield. In addition, varieties bred for specific agro-ecological zones will not necessarily perform well in national tests. There is a fee for this testing and so the system is biased towards cash and major food crops, to justify the cost of varietal registration (Minot, et al., 2007).

The Plant Variety and Seeds Act 21 of 1995 (as amended) covers the regulation of seed imports and exports, cleaning, testing, minimum standards of germination and purity, certification, and sales and deals with prescribed seed. The SCCI is designated as the certifying authority responsible for administering the Act. Businesses dealing in any of these aspects of seed production and distribution must be registered, after meeting the requirements of the Act. Private seed companies may be licenced as certifying agencies (s17.1). For seed imports, a certifying agency (which may be a private company registered with the SCCI) may accept a country of origin analysis regarding the minimum standards (s44.4). This bypasses the need for further testing within Zambia. The Act refers to prescribed seed, i.e. seed for which prescribed minimum standards have been

53. <http://www.planttreaty.org/>.

54. <http://zamdata.com/posters/130716060743The%20Plant%20Breeder%5C's%20Right%20%28Forms%20and%20Fees%29%20Regulations,%202011.pdf>



assigned. Section 66 allows for seed to be sold as QDS, despite it not having been through the full procedures (listed in s59), but provided that it was produced by a registered seed producer and has shown through testing that it conforms to the required standards of germination and purity. In essence, farmers may engage in any of these activities, but they must meet the requirements and conditions and must pay the necessary fees which are determined by regulations to the Act. Regulations pertaining to the Act were updated in 2006.

Zambia has modelled its seed certification system on that of the Organisation for Economic Cooperation and Development (OECD) (SCCI, 2015). The SCCI oversees the management of quality seed and certification, through inspections, testing and variety release (ISSD Africa, 2012). Seed lots are sampled according to ISTA rules and submitted for laboratory tests to determine purity, germination capacity, moisture content, vigour and health. If successfully passed by the Variety Release Committee, the seeds are certified for sale (SCCI, 2015).

Seed importers must apply for a permit from the SCCI before starting import procedures. On arrival in the country inspectors check that the seed conforms to the import permit. To export seed, an application must obtain an ISTA seed analysis certificate to declare the quality, if required by the receiving country, or a national seed certificate, along with a phytosanitary certificate (Miti, 2010).

The legal and policy framework is biased against the development of farmer-managed varieties and in favour of improved, certified varieties. The National Biodiversity Strategy focuses on ex-situ as opposed to on-farm conservation of genetic diversity. While the National Agricultural and Co-operatives Policy (2003–2015) aims to promote the conservation and use of these varieties, it is not explicit regarding how farmers, as the guardians of traditional varieties, will be supported and empowered.

Zambia's seed sector is influenced by international and regional agreements. Zambia ratified the Convention on Biological Diversity in 1993 and its National Biodiversity Strategy and Action Plan (1999) promotes the conservation, management and sustainable use of Zambia's biological resources and the equitable sharing of benefits. The Biosafety Act of 2007 deals with the establishment and functions of a National Biosafety Authority and the regulation of activities relating to genetically modified organisms (GMOs), risk assessment and management.

Since 2013 Zambia has been subject to the COMESA seed trade harmonisation regulations. These aim to facilitate regional seed trade by harmonising seed certification standards and phytosanitary rules and establishing a regional catalogue of varieties of authorised seeds to be marketed and grown in the region. Although the agreement is legally binding in Zambia, there is some indication that the government has decided not to put these regulations into effect. As a member of the SADC Zambia is also subject to the Technical Agreements on Harmonisation of Seed Regulations; these regulations focus on variety release, seed certification and phytosanitary measures. Their aim is to facilitate seed trade in SADC countries and increase the availability of improved seed from the private sector. Seed on the SADC register must meet the DUS test and be released in at least two member countries, in which case it can be traded in all SADC member states with no restrictions (AFSA and GRAIN, 2015). These regulations promote the breeding of industrial seeds; they also make illegal the trans-boundary movement of non-registered seeds, such as farmers' uncertified varieties, thus marginalising these varieties and the traditional knowledge regarding their use and cultivation.

The SADC-EAC<sup>55</sup>-COMESA Free Trade Area (FTA) was launched in June 2015 and will come into force once it has been ratified by two thirds of the 26 member states. The Africa Solidarity Trust Fund for Food Security, an Africa-led fund established in 2013, has implemented a project

55. The East African Community (EAC) is the regional intergovernmental organisation the members who are Burundi, Kenya, Rwanda, the United Republic of Tanzania, and the Republic of Uganda.





to strengthen controls for food safety and to manage plant and animal pests and diseases (FAO, 2015). The fund also proposes to tackle the lack of technical, human and financial resources to comply with the standards required by regional and international trading partners. In Zambia, the project will focus on addressing the threats posed by trans-boundary pests and diseases.

### **Role of public sector in R&D and production**

As suggested in the legislative and policy overview, public sector institutions play a central role in regulating the formal seed sector. Historically they have also played the central role in R&D and seed production. Despite liberalisation and the opening of spaces for private sector involvement in seed R&D, the public sector continues to be the main actor in Zambia.

Public sector plant breeding in Zambia started in 1954. ZARI, formerly the Soil and Crops Research Branch (SCRB) within the Ministry of Agriculture, is the main public sector plant breeding institution in Zambia. SCRB was transformed into ZARI in 1991 as part of the corporatisation and liberalisation of agricultural R&D. Overall agricultural R&D had declined precipitously between 1971 and 2008, including public investment in breeding (International Food Policy Research Institute (IFPRI), 2015). The private sector became involved in plant breeding in 1986. Other breeding institutions with public sector involvement include the Cotton Development Trust (CDT), a public-private partnership, the University of Zambia's School of Agricultural Sciences (Lungu, 2006), and GART.

ZARI is responsible for developing seed varieties and improvements suited to different agro-ecological conditions, and focuses on both hybrids and OPVs. All those involved in the seed industry can access the Institute's genetic materials on the basis of an SMTA. ZARI's research is disseminated through the government's extension services (see above).



Chikankata

The Institute is also responsible for genetic resource management through the National Plant Genetic Resources Centre (ISSD Africa 2012). The Institute concentrates on crops with high commercial value and with which the private sector is involved, such as maize, wheat and soya beans. This has resulted in a shortage of quality seed for traditional and self-pollinated crops (ISSD Africa, 2013).

ZARI's Crop Improvement and Agronomy division is where breeding takes place for all the major crops in Zambia, including legumes (cowpeas, groundnuts, beans, pigeon peas, soya beans), maize, and some sorghum and millet. ZARI develops new varieties, tests and validates these with farmers, and then sets up demonstrations with the extension division within the Ministry of Agriculture. Private seed companies then undertake the commercial marketing. There has been a recent focus on small seed companies, according to Petan Hamazakaza, ZARI's Principal at the Kabwe Research Station.<sup>56</sup> The focus on these companies was stimulated by AGRA sponsorship. ZARI's Farming Systems and Social Sciences department focuses on assessing the seed requirements of small-scale farmers, looking at factors that hinder seed production and access to improved seed. District-based innovation platforms are developed to improve farmer access to improved maize varieties,

56. Interview, Petan Hamazakaza, Principal, ZARI, Kabwe Research Station, 26 June 2015.

in particular. Seed companies, agro-input suppliers and farmer organisations such as the ZNFU are involved. ZARI's core costs are covered by public resources although individual programmes may receive external funding. ZARI is working with seed companies and universities on the World Bank sponsored APPSA (see Green Revolution initiatives above). At the international level, ZARI collaborates with the International Institute for Tropical Agriculture (IITA), the International Maize and Wheat Improvement Center (CIMMYT) and other CGIAR institutions.

ZARI produces the basic breeder seed, processes it into foundation seed and then hands it to seed companies for commercial production, on an exclusive basis. According to Petan Hamazakaza, research knowledge is a public good, but decisions about intellectual property rights (IPRs) are made elsewhere. He recommends that royalties and licensing fees be used to provide resources to fund public research.

Kamazakaza says that ZARI does not have the capacity to market seed and this is not ZARI's area of work. Previously, Zamseed had a monopoly on government seed production and marketing, using varieties developed by ZARI. A memorandum of understanding (MOU) between SCRB and Zamseed assigned ownership of new varieties to Zamseed. This agreement came to an end in 1998 with the liberalisation of the seed sector (Lungu, 2006:7). Seed is not crossed at the farm level although farmers have assisted with variety selection; breeders do the crossing at ZARI. There is a tendency to focus on hybrids because OPVs are difficult to market.<sup>57</sup>

Maize, sorghum and millet received around two thirds of SCRB's research budget, with a lesser amount reserved for root and tuber crops, wheat and rice (Lungu, 2006:8). Varieties that were evaluated, released and registered by public sector institutions and PPPs for commercial production in Zambia, until 2010, included maize, wheat, sorghum, rice, pearl

millet, finger millet, Irish potatoes, cassava, sweet potatoes, groundnuts, beans, peas, cowpeas, pigeon peas, soya beans, sunflowers, green gram, bambara nuts, guar, tobacco and cotton (Miti, 2010).

Government may provide farmers with breeders' seed or basic seed on a cost-recovery basis, but there is an inadequate supply of breeder and foundation seed of local and subsistence crops, a shortage of quality seed for traditional crops, and there is little public research into these varieties or any work to improve them (ISSD Africa, 2012). Charles Nkhoma of CTDT says: "Because of the regulations, traditional types of seeds do not qualify to be called a variety. So there are limitations both in terms of producing seed and as a crop. So most of these crops like bambara nuts and the diversity of ground nuts rather than just the one commercial variety, they are all grown in very small quantities. We hope they won't disappear but they will never increase in quantity because there is no driving force for farmers."<sup>58</sup> The government has set up regionally located seed service centres to provide information to farmers around seed issues, conduct field inspections and support local businesses with processing seed and training them in seed certification (ISSD Africa, 2013).

Some public sector extension is still in operation, although its scope is reduced. According to Petan Hamkazaka,<sup>59</sup> ZARI is involved in some participatory activities with farmers (even if these are restricted to variety selection):

*When we do demonstrations with farmers, they are given a basket of options of different varieties, and management practices. So they assess these under their own conditions. We normally have a survey which we circulate to farmers. Farmers can freely respond to how they feel about the different varieties in terms of drought resistance, grain size, colour, taste, texture, and vigour in terms of still maintaining*

57. Interview, Petan Hamazakaza, Principal, ZARI, Kabwe Research Station, 26 June 2015.

58. Interview, Charles Nkhoma, Director, CTDT, Lusaka, 10 June 2015.

59. Interview, Petan Hamazakaza, Principal, ZARI, Kabwe Research Station, 26 June 2015.



*growth even if the soil is bad ... At every stage of the demonstration we are collecting the relevant information. So ZARI works with community-based extension workers. Once every three or four weeks we go out to capture that information that is relevant at that time, and also then at post-harvest. This is done for the varieties we are doing trials on. We test a maximum of three or four varieties at farm level.*

AGRA's work on plant breeding R&D currently supports public sector activity, although it aims to support the commercialisation of production and distribution. AGRA has provided small grants to ZARI and SCCI for the breeding of improved varieties of maize, rice and sweet potatoes (Appendix 2). Between 2007 and 2014 AGRA sponsored 11 PhD candidates at UNZA, studying plant breeding and agronomy, focusing on beans, cassava, sweet potatoes and maize. Four of the six who had graduated by 2014 accepted employment at ZARI, while another has become an expert attached to the SCCI. AGRA also funded 22 MSc students studying crop and soil science and has trained 21 laboratory technicians in plant and soil analysis best practice. Graduates specialising in crop breeding have contributed to the release of 13 new varieties—five sweet potato, three rice and five maize—four of which were commercialised by public and/or private seed enterprises and released to farmers (AGRA, 2015).

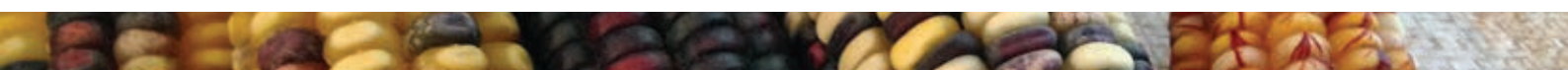
### **Private sector involvement**

Until the mid-1980s, the public sector was the only actor in seed breeding, production and distribution. However, declining public sector expenditure for agriculture and the process of liberalisation have opened the door to private sector involvement. In 1986 private companies started plant breeding activities in Zambia. The Maize Research Institute (MRI) was originally a private company from Yugoslavia which in 1980 established a site for maize breeding for the European market. It collaborated with SCRB on germplasm exchange and the training of Zambian maize breeders, and was eventually established as a private Zambian company in 1995. As its name implies, MRI focused on maize breeding but in the 2000s diversified into soya beans as well. The source of its

germplasm is a combination of public sector gene banks and international transfers (Lungu, 2006:5).

Pannar Seed entered Zambia in the mid-1990s, following deregulation and liberalisation. However, until at least the mid-2000s it kept its plant breeding operations in South Africa and conducted only a few evaluations and experiments in Zambia; during that time its presence in Zambia was mainly as a trading outpost for the South African company. All Pannar Seed's breeding material is proprietary. The same approach applied to SeedCo's initial foray into Zambia, with some evaluations but no full-scale breeding activities in the country during the early period after entry (Lungu, 2006:11-14). From 2002 to 2013, 126 new maize varieties were released, almost entirely privately owned, but most of these were developed outside Zambia (Smale, et al., 2013:6). One of the reasons for this is the lack of plant breeding capacity, but it is likely also that breeders have been waiting for clarity on PBRs and IP issues to secure their investments. However, the adoption of the Arusha PVP Protocol in July 2015 at ARIPO is unlikely to have a major beneficial impact on breeding capacity within Zambia; seed bred elsewhere in the region will enjoy easier access into the Zambian market and there will be no reason for private companies to establish seed breeding and R&D facilities in each and every country.

Liberalisation in 1991 opened Zambian seed production to MNCs. Pioneer Hi-Bred was the first company to register a maize hybrid in Zambia in 1992—the breeding was done in Zimbabwe—and companies such as Carnia, Cargill, Pannar, SeedCo and MRI soon followed suit (Pray, et al., 2011). At present four private companies dominate seed production in Zambia: MRI, SeedCo, Pannar and Zamseed (the privatised former state-owned enterprise). In 2011 the top two companies produced 65% of certified seed and the top four 85–90% of certified seed (World Bank, 2012). Figures from 2011 indicate that SeedCo had a 50% share of the Zambian commercial seed market, MRI 17%, Zamseed 15%, Pannar 12%, and Monsanto and Pioneer owned 3% each (Renaissance Capital, 2011). Mergers and acquisitions in the seed sector are ongoing. In 2012 Pannar was swallowed by US-based giant Pioneer





Hi-Bred. In 2013 Syngenta acquired MRI with its extensive collection of maize germplasm. French seed giant Groupe Limagrain, the largest seed and plant breeding company in the European Union, purchased 28% of SeedCo at a cost of US\$ 60m. SeedCo also sold 49% of shares in its cottonseed company—the only African-owned such enterprise on the continent—to Indian company Mahyco, which is partially owned by Monsanto (26% ownership) (AFSA, 2014).

Improved maize seed adoption rates in Zambia are among the highest in the region after Zimbabwe and South Africa, with up to 90% of maize seed being hybrids (including recycled hybrids). A HarvestPlus baseline survey indicated that more than two thirds of maize seed in use have been named F1 hybrids, with another fifth being recycled hybrids or improved OPVs (Smale, *et al.*, 2013:7). It is apparent that the focus of private sector production is on hybrid maize. In 2012 there were more than 210 maize varieties on the official register, while 36 soya bean varieties were the next largest number (USAID and USFDA, 2013:24).

About 30 000 tons of hybrid maize seed is produced in Zambia each year, of which around 60% is exported—this makes Zambia one of the largest seed exporters in Africa. In 2011 Zambia exported 17 891 tons of certified seed to other African countries (World Bank, 2012). In terms of domestic demand, FISP soaks up a large portion of the hybrid maize seed produced by major companies, at about 9 000 tons of seed in 2011 (World Bank, 2012).

As indicated above, AGRA's seed programme, PASS, received around 61% of total AGRA grants in Zambia from 2007–2012. Under the sub-programme, Seed Production for Africa (SEPA), AGRA provides funding support and business training to local entrepreneurs to establish and build independent seed companies to produce and distribute seed. AGRA supported five seed production enterprises through small grants in 2007–2012 (Table 2A, Appendix 2). These were Kamano Seed Co, Kamasika Seed Growers' Association, Indigenous Seed Co, IDE and Stewards Globe Ltd. Funding amounted to roughly US\$ 750 000 and was used to provide improved varieties of local crops, such as cowpeas, sorghum, finger millet and okra.

AGRA's strategy is to develop existing small and medium seed businesses that are close to farmers who need seed, or that have existing networks with farmer groups (AGRA, 2014).

AGRA claims that most farmers who have accessed improved seed have doubled their production (AGRA, 2015a) although it is difficult to find the data to validate this claim. AGRA's 2015 progress report indicates that over a seven-year period, up to 2014, its initiatives have led to just more than 616 000 farmers using improved seed varieties on about 250 000 ha of land. About 8 500 tons of improved seed have been produced (AGRA, 2015).

Kamano Seed is a small, emergent local company that had no prior experience in R&D and had none of its own varieties. It started out selling legume seed and then, using seed from the CIMMYT, began selling improved OPV maize and developing networks among small-scale farmers and agro-dealers in Zambia's north-western province. The majority of its initial clients were NGOs. The company then introduced maize hybrids and this now forms the bulk of its focus and sales (Minot, *et al.*, 2007). AGRA granted Kamano a two-year grant of US\$ 166 300 which ended in 2010, to produce and supply the improved seed of maize, beans, sorghum, groundnuts and cowpeas (AGRA, 2015b).

AGRA granted Indigenous Seed Co US\$ 200 000 over three years, ending in 2013, to produce and disseminate improved seed for maize, beans, sorghum, groundnuts, soya beans, finger millet, okra and cowpeas (AGRA, 2015b). AGRA provided Kamasika Seed Growers Association a grant of US\$ 210 550 between 2010 and 2013, to provide the improved seed of maize, sorghum, beans, cowpeas and groundnuts (AGRA, 2015b). Kamasika was also supported by EU-funded programmes, one of which was the Right to Seed initiative which was implemented by the NGO, Self Help Africa (Jacob, 2009). Farmers from the association were trained in seed multiplication, treatment and storage and it was able to open a storage depot, a retail store (which also carried other inputs), and a seed testing laboratory. The laboratory was built with funds from the UK's Department for International Development





(DfID). According to Peter Manda of Nutri-Aid Trust, Kamsika Seed closed down in 2015; no reasons were given for its closure.<sup>60</sup>

Stewards Globe Ltd (now renamed Afri-Seed) was granted US\$ 158 291 by AGRA to enhance access to improved seed varieties. Stewards Globe worked with farmers in Chisamba and Mumbwa to grow seed, on 5–10 ha farms, planting maize, soya beans, groundnuts and beans. The germplasm is provided by CIMMYT and Stewards Globe commercialises and registers it. The company also obtains foundation seed from the Mount Mukulu Research Station (ZARI and SCCI).<sup>61</sup> According to Peter Manda it is all hybrid maize.

### **Case study: International Development Enterprises (IDE) and small-scale farmer seed production**

IDE is a UK-based development agency which began working in Zambia in 1997; currently it is working in five provinces.<sup>62</sup> Between 2009 and 2011 IDE was given US\$ 170 000 to promote the availability of improved seed in Zambia.

The AGRA grant was very exciting for IDE who had struggled to convince AGRA to consider them, because AGRA wanted to deal with the private sector and not NGOs. However, AGRA eventually gave IDE the grant because they were working with small-scale farmers already, and had their systems in place, which meant that farmers would get access to seed fast. They used the IDE's FBA model which was already established in other programmes. The grant was small so it was attached to other IDE projects in the Southern, Central, Copperbelt and Lusaka provinces.

IDE's work for AGRA has focused on commercial seed production by local farmers, in particular pulses and legumes (cowpeas,

three types of sweet beans, soya beans, and groundnuts). They tried to include sorghum but could not access any breeder seed. They specifically chose crops that are not usually available on the commercial market, but for which there is high local demand from small scale farmers. These crops used to be grown widely and some farmers still have small amounts of these varieties; they save the seed because they want the seed for future use. But they have declining yields, and erratic rainfall has limited the amounts that farmers can grow.

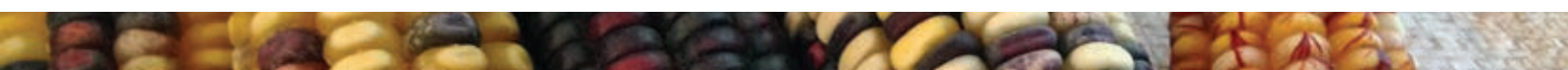
Farmers were included in decisions about which crops to target. FBAs and some of the 'follow farmers' in their group were trained to become seed producers and to establish formal registered seed associations. IDE took them through the formal seed certification channels although farmers paid for most of the costs themselves, including registration with SCCI and the SCCI inspections and purity tests. With the AGRA grant, IDE paid for breeder seed from SCCI and for its multiplication, in the beginning, with a select number of established farmers (not necessarily from the local area) and farmers then paid for the basic seed themselves. IDE provided support regarding organisation and training, and facilitated the packaging and marketing of seed. The seed was sold mostly on the local open market and also to seed companies, including Zamseed and Kamono. Farmers did not receive any handouts in the course of the project.

SCCI 'owns' the breeder seed and seed grower associations could apply for special permission to recycle their seed, but only once. SCCI was very reluctant to permit even this small anomaly and farmers had to negotiate hard—and they still need to go through the normal certification processes again. IDE's biggest challenge in Zambia was gaining access to breeder seed; this was an even greater challenge for farmers working

60. Interview, Peter Manda, Director, Nutri-Aid Trust, Lusaka, 14 July 2015.

61. Interview, Peter Manda, Director, Nutri-Aid Trust, Lusaka, 14 July 2015.

62. The information in Box 3 is based on a composite of interviews with IDE staff: Melanie Wilkinson, Country Director, Lusaka, 20 July 2015; Kenneth Chileshe, Programmes Coordinator, Lusaka, 22 July 2015



on their own after the project ended. Other seed companies may hold breeder seed but they do not want to share it—regardless of the terms of any negotiations. As a result, only a few farmers and seed associations have continued with the formal process.

IDE does not work with AGRA currently but has established a new group of seed growers, using a model similar to the model employed in the AGRA project, but working with a seed company called Afri-Seed (formerly Stewards Globe). The new venture takes the form of an outgrower project, where a seed company commissions farmers to grow a specific commercial seed for them, provides the basic seed and then buys back what farmers have multiplied, to sell the product commercially.

IDE has subsequently shifted its focus to market-based approaches rather than inputs—especially now that the private sector has made substantial inroads in this field—and is exploring the whole value chain. Cowpea is an example of IDE's current value chain work, but only now that there is a commercial market and cowpea is needed to promote crop rotations for CSA. IDE used to work with the poorest farmers and injected credit at that level, before it achieved a business trajectory. Since then it has shifted focus to support farmers who have already made the change to business farming and who are already financially viable. These farmers are still small-scale farmers, producing on 1–5 ha, but are further up the economic ladder.

There are high levels of competition in the seed sector; national seed companies are struggling to compete against international companies with greater purchasing power, due to their size and international linkages, and their investments in structured production and marketing bases (ISSD Africa, 2012). National companies face high production costs, high freight charges and fluctuations in the ZMK against the US\$, particularly as they spend

most of their resources in the competitive hybrid maize markets due to FISP (ISSD Africa, 2012). The costs to establish and run a seed business in Zambia are close on US\$ 500 000 a year, making it prohibitive for smaller players and reinforcing the bias towards producing seeds protected by IPRs. According to Petan Hamzakaza, “maybe these smaller seed companies will stabilise, otherwise they will just be bought by the big seed companies”.<sup>63</sup>

### **Efforts to involve small-scale farmers in seed production**

SCCI regulations allow for QDS which is evaluated under more flexible criteria (Louwaars, 2005). The QDS system is intended as a stopgap to ensure that farmers have access to improved seed locally, in the absence of certified seed. It can also be used as an intermediate stage of seed production between on-farm recycling without systematic quality controls, and certified seed production that follows rigorous procedures. It is useful for countries with limited resources as it is less demanding than formal certified systems, but may still guarantee a satisfactory level of seed quality (OECD, 2012). The SADC Technical Agreement on Seed Certification and Quality Assurance provides conditions for QDS production, stipulating that a variety must be listed on the SADC Variety Catalogue; and production must be registered with the National Seeds Authority, which will check 10% of the seed crops. Zambia follows these procedures (Miti, 2010). However, support to QDS is underfunded and seed growers still need to submit seed for testing. The commercial sale of local varieties in Zambia is not permitted without some form of quality assurance certification (Tripp, 2006).

Concern and the CFU are engaged in a joint activity to promote seed growing in the communities in which they work. Their aim is to get local well-established farmers to produce QDS that can be sold in the local area. Concern has supported farmers to establish themselves as registered seed growers and to work as a cooperative of seed growers to

63. Interview, Petan Hamzakaza, Principal, ZARI, Kabwe Research Station, 26 June 2015.



produce, test, select, package, register and market their seed. They will be able to sell independently but will mostly link with agro-dealers in the area and they will market the seed. Carl Wahl at the CFU says<sup>64</sup> they have found that women seed sellers tend to market and sell the seed themselves within the community, while men tend to sell through agro-dealers. In the first year of the project farmers were given certified seed to grow, and Concern purchased the seed back from them to use in their programmes with poor farmers, where seed is supplied free of charge. In the second year seed growers were meant to sell the seed themselves, through local agro-dealers. However seed growers generally were artificially brought into this process by other NGOs working in the area. Some NGOs tend to do everything for farmers, turn them into a seed company, provide packaging equipment, provide a building, provide the whole seed selling business. But really seed growing is a small part of the year for these farmers who are also doing many other things—farming, fishing, operating as agro-dealers. Farmers themselves are not necessarily saying they want to be full-time seed growers.<sup>65</sup>

Says Charles Nkhoma of CTD:

*They say the regulations for small-scale farmers are less stringent, but what you say is less stringent is still prohibitive enough, as farmers have to register, be inspected, and pay fees. So the involvement of farmers in [certified] seed production has been very limited. The only reasonable farmer involvement would have been one that targets production by farmers to produce seed that is locally appropriate, so including traditional varieties.<sup>66</sup>*

Kasisi has grown Gankata and distributed some to farmers who had lost their own seed. However, they say that the seed laws require all commercial seed to be treated, while organic principles do not allow the treatment of seed. So unless a very good organic treatment for

the seeds can be found, farmers cannot be recognised as formal seed producers.<sup>67</sup> KATC has also helped farmers to grow ZM521 seed, a Zamseed developed OPV for dry conditions and Kasisi helped farmers to get it SCCI certified. The effort resulted in formation of the Chongwe Seed Growers Association. Kasisi has grown and marketed to farmers organic Afric 1 and ZM621 OPV seeds which were SCCI certified. The challenge for Kasisi has been storage pest protection for an organic product.

Most government-sponsored community seed banks in Zambia are reliant on seed bred by ZARI, as opposed to preserving local traditional varieties. Seed banks effectively become conduits for improved seed and in some cases, multipliers of seed for commercial producers and traders who buy seed from the banks at very low prices, repack them, brand them with their logo and sell the product for up to four times the cost. Even those seed banks belonging to seed growers' associations tend to promote only the use of improved varieties. Efforts have been made to collect local varieties under the community seed banks programme, but seeds were not redistributed to members (Development Fund, 2011). (See Appendix 3 for recent farmer-managed seed projects.)

## Seed assessment

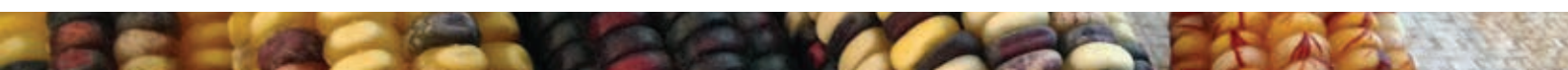
It appears that there is a major issue regarding the diversification of varieties being improved and produced. Stringent seed laws and regulations make it difficult for small-scale farmers to be involved in seed improvement and production for commercial purposes. The regulatory framework tends to support specialisation, i.e. if you want to be a seed producer you must focus solely on that and leave crop farming to others. Otherwise you must be a crop farmer, purchase your seeds and leave seed production to the specialists. This breaks down the unity of the production system and separates input supply and production into discrete areas of work. Maybe there are benefits to specialisation, but for

64. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015

65. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015

66. Interview, Charles Nkhoma, Director, CTD, Lusaka, 10 June 2015.

67. Interview, Daniel Kalala, Research Coordinator, KATC, Chongwe, 8 June 2015.







Local OPV varieties grown for home consumption, Chikankata

most small-scale, resource-constrained farmers, this is not a realistic option. The systems they are already using should be strengthened and enhanced rather than stripped away and replaced with an entirely new system. Maybe some of these farmers will emerge as specialist seed producers. But if this is to become an organic and embedded process, it will need to start with *in situ* or localised experimentation and seed enhancement, for specific local conditions. The trouble with the Green Revolution approach is that it is disruptive to many, while only a few really benefit. Disruptive technologies are all the rage in the world today. But when the distribution of costs and benefits is so unbalanced, and when those who bear the costs (in the form of loss of access to land, higher input costs and low output prices) are the same people who have the least resilience and flexibility, we are forced to ask ourselves questions about the assumption of automatic benefit for any and every technological advance. Farmers must have control over this process. It is already clear that farmers are innovators and experimenters—they would not survive without these abilities. Nevertheless, they are not being given an opportunity to participate in the innovations and experiments; instead they are being labelled as passive consumers of technologies developed by others, and treated accordingly.

Zambia's seed laws incorporate various aspects of farmers' rights. This is positive. Not all farmers want to be commercial producers, and a case can be made that any commercial producer should have to follow a set of standards. This is as long as these standards make sense and are not simply a uniform imposition which makes things easier for others. But much seed and seed types apart from maize are still being produced year after year by farmers themselves, who experiment with and enhance their seed individually or with their neighbours. Policy does not adequately provide support for these activities—it does not orient public sector resources and support towards development of this vast base of situated knowledge and expertise.

Carl Wahl of Concern Zambia has commented:

*The seeds Zambia had and still has are good enough, they just need to be managed properly. In the ideal situation we should relook the whole process, work with small farmers in a small clustered area, with different crop varieties, this is how they are grown, saved, stored, used. Work on small savings and loan associations, access capital within the group itself, access markets. This works and people save seeds and see the benefits.<sup>68</sup>*

Instead, laws are oriented to the protection of proprietary ownership of seed varieties, and—whether intended or not—they facilitate an ongoing emphasis on hybrid maize, to the almost entire exclusion of any other crop. This is not sustainable in the long run. Regional PVP laws will limit investments in plant breeding R&D in countries that do not have strong systems already. Instead, all the work will be done in those places that already have the capacity (and the claims to ownership rights) and these seeds will simply be shipped into Zambia and other countries in the region from outside. Reliance on external inputs for crop production will be reinforced and entrenched.

68. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.





## SOIL FERTILITY AND SYNTHETIC FERTILISER

### Agro-ecological soil fertility practices and the shift to synthetic fertilisers

As with elsewhere on the continent, Zambian farmers have traditionally practiced aspects of what is now called agro-ecological farming. Basically, this is about using locally available resources in a way that sustains the resource base over long time periods. Farmers learned and shared these techniques amongst themselves, drawing on direct experience and experimentation. Long-standing practices include the use of indigenous nitrogen-fixing plants and green manures, mulching, biological pest management,<sup>69</sup> potholing, legume rotations,<sup>70</sup> composting,<sup>71</sup> and intercropping.<sup>72</sup> According to farmers:

We never used to apply this fertiliser, and the soil gave a better yield. There were different practices in the different agro-ecological areas and the different cultures. The Benba's used the *chitemene*<sup>73</sup> system, but now there is a shortage of land. The people in the south would plant in the same field, but they would use cow dung.<sup>74</sup>

However, these agro-ecological practices are labour intensive. As farmers explain:

*The soil is so bad now and you need to put a lot of compost and protect the soils from drying out, using methods of composting and green manure on local varieties. But this is 100% hard labour. So if commercial seed varieties can be purchased, these are planted just with fertiliser and no other*

*sustainable practices are employed, in order to reduce labour intensity. The problem is composting and green manure is too labour intensive to do on all the fields, so we do it for the local varieties and just have to buy fertiliser for the hybrids.<sup>75</sup>*

Farmers have also indicated a problem with the shortage of manure and indicate they would use it more if it was more available.<sup>76</sup>

Hybrid maize and synthetic fertiliser are part of an integrated Green Revolution package. Thus the introduction of hybrid seed has knock-on effects on soil fertility practices because farmers are encouraged to use synthetic fertiliser to get closer to the genetic potential of the seed.

*This drive by the government and the big agencies and seed industry has made farmers believe that maize and hybrid is the only way. Not only 10 years, but from long, long before that. So we came from a diversified type of farming system to a single mono-crop type of farming. Even the colonial regime played a role in enforcing this type of conventional mono-crop farming, it was actually policy at one point, thought it would be a good technology with ploughing each year and the like.<sup>77</sup>*

The introduction of subsidised synthetic fertiliser has damaged sustainable agro-ecological practices: "Essentially farmers are getting this subsidised fertilisers and the soils are so degraded that we see that often even with the more sustainable practices, farmers still need to apply fertilisers."<sup>78</sup>

According to ZARI (2015), crop production in most Zambian provinces, with the exception

69. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

70. Interview, Charles Nkoma, Director, CTD, Lusaka, 10 June 2015; Interview, Susan Chilala, Secretary, RWA Zambia, Lusaka, 11 June 2015.

71. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

72. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015; Interview, Robson Nyirenda, Training and field extension, KATC, Chongwe, 6 June 2015.

73. *Chitemene*: Slash and burn to raise the pH of the soil.

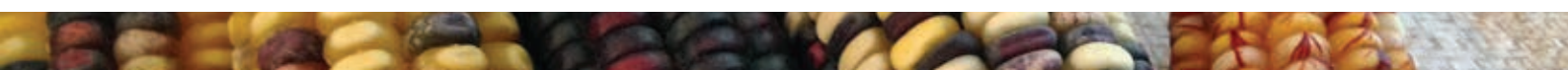
74. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

75. Focus group 1, Chongwe farmers, Chongwe, 6 July 2015.

76. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

77. Interview, Robson Nyirenda, Training and field extension, KATC, Chongwe, 6 June 2015.

78. Interview, Charles Nkoma, Director, CTD, Lusaka, 10 June 2015.





of the Central province, is difficult because the soils are acidic. According to Zambia's Ministry of Agriculture, the country's land base is fragile and easily degraded through both natural (water and wind erosion, salinisation and climate variability) and human processes, including nutrient mining, deforestation, overgrazing, population pressure, pollution and vegetation loss due to expansion (MAL, 2013). But the introduction of synthetic fertilisers is mainly to boost nitrogen to increase yields. Maize constitutes close to 75% of fertiliser use (Mason *et al.*, 2013) and farmers concur that fertiliser is used mostly used on maize.<sup>79</sup> The logic behind the introduction of synthetic fertilisers is that soils lack crucial nutrients or are unbalanced in other ways that limit yield potential—but this is not based on context-specific evidence. The last national soil survey was done over three decades ago (RMC, 2010) and it is certain that there are no systematic localised surveys which are necessary to understand soils in a particular context, rather than in general terms. This begs the questions: how are nutrient deficiencies identified, and what remedies are proposed? The present tactic is a profoundly unscientific approach that seems to be more about creating a market—for hybrid maize seed and synthetic fertiliser—than it is about identifying and resolving specific soil nutrient deficiencies.

The entire Green Revolution edifice is constructed on this basis. Governments have been convinced that farmers have no option but to use these inputs, in order to pay for them farmers must make more money from their products, so markets must be created, farmers must commercialise, and farmers who cannot succeed as commercial producers must exit farming. It is the destruction of an entire integrated system, in order for some corporations to expand their activities and ensure unceasing growth in their revenues and profits.

The Green Revolution drive itself exacerbates soil erosion and leads to the reduction of soil fertility. For example, expansion onto virgin lands has exacerbated deforestation rates (Toenniessen *et al.*, 2008). Zambia is now the fourth most deforested area in the world, losing up to 300 000 ha of forest a year (USAID, 2015). The spread of cattle diseases in the 1990s, following the withdrawal of government services such as cattle dipping, also affected soil fertility as about half the country's livestock had to be destroyed (IFAD, 2014). Smallholder farmers typically use draught animals to prepare soil for cultivation and use the manure for fertiliser for the land. These practices were affected by the loss of livestock, indicating a direct relationship between liberalisation and the decline in soil quality. The push for higher yields also comes at a cost. As farmers from Chongwe and Rufunsa explained:

*It's the hybrids that are made for fertiliser. The more you use a chemical the less you yield and the more you are forced to use! We have seen a change in the soil. But it would be difficult to shift for some farmers. If you are looking at us, yes we want to change, because we are looking at the soil. But there are those others, for business sake, I don't think they would want to change because they want to just produce more and more and they are not looking at the soil. If you want to take money quickly you have to use those chemicals.<sup>80</sup>*

79. Focus group 3, Nadezwe farmers, Chikankata district, 16 July 2015.

80. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.



Charles Nkhoma of CTDI said:

*Soils are so degraded that often even with more sustainable practices, farmers still need to apply fertilisers. One thing that has resulted from this programme is soil degradation. This system of production which is based on tillage, fertiliser and these external inputs, because the commercial varieties cannot be grown without these external inputs. In the early days, if one didn't have enough fertiliser the commercial crops would still do reasonably well because the soils were still quite healthy. Now, unless you put the maximum recommended amount of fertiliser, the crop suffers, and the soil suffers ... So farmers will be very ambitious at the beginning of the season, they will plant. But when they apply their limited fertiliser, and the crops fail, it makes them want to not continue and they have to give up farming. The crop looks so miserable, you'll find a lot of abandoned fields as crops fail. Farmers put a lot of time and money into preparing the fields, and then their crops fail and the soils are further damaged ... Fertilisers in Zambia have now been excessively used for close on 40 years probably. So now it's difficult for farmers to go back.<sup>81</sup>*

Another example of the breakdown of traditional practices for maintaining soil fertility is the reduction of fallow periods, which is the result of intensification of production in an effort to raise yields (Symons, 2007). Fallowing is necessary for the soil to recuperate. Nutrients lost due to soil erosion, leaching and removal in harvested products are not adequately replaced and the result is that arable cropland is severely depleted (MAL, 2013). Nutrient balances for the region show large negative values and losses of nutrients are estimated at more than 50 kg/ha annually (Zingore, n.d.). In addition, heavy metal residues from mining activities have been found in soil and water samples taken from most parts of the country (Ikenaka et al., 2010). The Green Revolution and the agricultural liberalisation that underpins its expansion are creating the

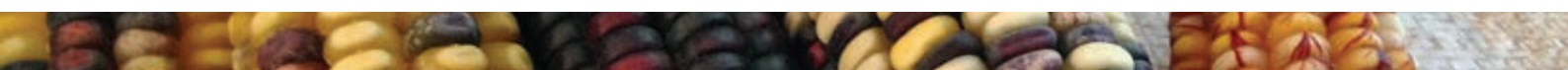
need for synthetic fertiliser—as traditional soil fertility practices are disrupted, the soil itself suffers, and this is used as evidence that synthetic fertilisers are necessary.

The emphasis then shifts to 'training' farmers to cope with these new conditions; essentially this means redirecting farmer knowledge towards how to handle and manage synthetic fertiliser. According to the IFDC (2013), most smallholders do not know how to use fertiliser. Poor fertiliser choice and application practices can worsen soil acidity, which is often caused by high rainfall levels that set off hydrolysis reactions that progressively acidify and leach the bases throughout the soil profile (Symons, 2007). Mismanagement can actually exacerbate fertility constraints, as opposed to increasing yields, which places further financial strain on rural communities.

The average fertiliser application rate in Zambia (2010/11) is about 90 kg/ha, which is higher than the Abuja Declaration target of 50 kg/ha by 2015 (World Bank, 2012). In 2011, Zambian farmers used 300 414 tons of fertiliser; the increased use is supported by FISP—which finances 61% of fertiliser used in the country (World Bank, 2012)—as discussed above. However, 60% of smallholders (the majority of farmers in the country) do not use synthetic fertilisers (World Bank, 2012), which suggests that those who are using it are using much higher amounts. The vast majority of fertiliser is used by commercial farmers and beneficiaries of FISP, which, as indicated previously, encompasses better-off small-scale farmers with larger landholdings. D-Compound and urea are the main fertilisers imported and used in Zambia (IFDC, 2013). Access to fertiliser is differentiated across the country with those in the Lusaka, Central and Copperbelt provinces having more access than the more outlying provinces (World Bank, 2012).

The IFDC (2013) estimates that an additional 248 000 tons will be required to meet agricultural growth targets set out in the CAADP country investment plan. This requires the orientation of investment to develop

81. Interview, Charles Nkhoma, Director, CTDI, Lusaka, 10 June 2015.





fertiliser value chains to deal with the doubling of fertiliser importation, storage and distribution. It is a circular logic, with the imperatives of growth set in the Green Revolution policies leading to imperatives for greatly increased synthetic fertiliser use. But fertiliser is very expensive, hence the need for government subsidies; this diverts resources that could be used elsewhere into supporting MNC penetration into Zambian agriculture. According to farmers:

*The price for fertilisers has gone up and up. You want to buy 10 bags but actually you end up only buying 3. So then to make it stretch for the whole land you have to mix it and spread it over the whole fields even though it is not enough ... So if you are planting one hectare, but you end up only having enough fertiliser for half a hectare, so for you to make it, you wait until the maize has come up a bit and then you mix the fertiliser, you put once, and spread it across the whole field instead of putting fertilisers twice ... In short you take chances, you don't know exactly how much you need for each area because it changes from place to place, you don't know the quantities required so you just take chances.<sup>82</sup>*

Kasisi experiments comparing organic and conventional (i.e. Green Revolution) techniques found that farmers struggle with the costs of synthetic fertiliser as well as labour:

*The truth is conventional maize farming is too expensive for the common farmers. There is a permaculture trial we have been running for the last five years at Kasisi. We have four control farmers who are maize mono-cropping, relying heavily on synthetic fertiliser. So far only one farmer managed to break even, once in year two. They are all making a loss. This is due to the cost of fertiliser but more especially the labour. Most of the time labour is not*

*valued in real terms in agriculture here because it is done by the family. But when it is measured correctly, it shows that this form of farming is a complete loss. None of the farmers are even breaking even, let alone making a profit.<sup>83</sup>*

The UNZA has produced some innovative agricultural products, including a cheaper way of making fertiliser from Sinda phosphate rock and phosphoric acids. The technology is in the process of being patented before being released on the market (PRESTID, 2014). There has been no comment on the environmental effects of the product.

### **Commercial industry and main actors**

Zambia is a 'price-taker' where fertiliser is concerned as domestic production is limited and dependent on a state-run company, Nitrogen Chemicals of Zambia (IFDC, 2013). There are ten major fertiliser importers in Zambia including two domestic blenders and a state-owned manufacturer (Table 2). Louis Dreyfus and the Export Trading Group (ETG) are involved in the fertiliser industry through wholesale sales and distribution (IFDC, 2013). As fertiliser dealers do not require licenses to operate there is no way to quantify them. Distribution is primarily through FISP deliveries to district governments and cooperatives (World Bank, 2012) and also through agro-dealer networks, as discussed earlier. A study conducted a few years ago found that most urea and ammonium nitrate fertilisers were purchased through agro-dealers, while D compound and some urea were accessed through cooperative channels (RMC, 2010). Fertiliser imports have fluctuated in the past two decades, dropping dramatically following liberalisation in 1992 but then recovering after 2002 with the launch of the input subsidy programme. Between 2002 and 2012 fertiliser imports rose from 70 000 tons to 100 000 tons, with ammonium nitrate by far the largest import in 2012.<sup>84</sup>

82. Focus group 2, Chongwe and Rufunsa farmers, Chongwe, 8 July 2015.

83. Interview, Daniel Kalala, Research Coordinator, KATC, Chongwe, 8 June 2015.

84. [http://africafertiliser.org/statistics\\_compare.html](http://africafertiliser.org/statistics_compare.html).





**Table 2: Major fertiliser importers in Zambia**

Company	Focus area
Omnia	Import and supply
Nyiombo	Importer/distributor
Export Trading Group (ETG)	Import and supply
Zendaki	Import and supply
Profert	Import and supply
Sasol/Bridgeway	Import and supply
Casitex (Yara)	Import and supply
Greenbelt	Import/blending
Zambia Fertiliser	Import/blending
Nitrogen Chemicals of Zambia	Import/blending

Source: World Bank, 2012; IFDC, 2013; RMC, 2010.

Major importers are from Zambia (Nyiombo, Nitrogen Chemicals of Zambia, Greenbelt, Zambia Fertilisers), South Africa (Omnia, Profert, Sasol), Kenya (ETG) while Yara from Norway will be entering the market shortly.<sup>85</sup> Importers operate their own distribution warehouses (IFDC, 2013) located in provincial and district centres close to FRA storage facilities (RMC, 2010). They also generally offer extension services. Distribution is through direct sales, development NGOs and FISP (RMC, 2010).

In 2014, Nitrogen Chemicals was awarded a FISP contract to produce 106 409 tons of compound D fertiliser (*Zambia Voice*, 2014). In addition, government embarked on a joint venture with Russia in 2011 to open a US\$ 27m organic liquid fertiliser plant in the Kapiri-Mposhi district, to increase fertiliser production capacity in the country (Lusaka Times, 2011); it began to supply to FISP in the 2014/15 season. Other fertilisers are imported from a diverse set of locations, including Saudi Arabia. Government recapitalised Nitrogen Chemicals of Zambia to increase production capacity to 150 000 tons of Compound D fertiliser. It will continue to provide funding in 2015 to enable the company to produce ammonium nitrate for the local manufacture of top-dressings

and explosives. This is intended to reduce the amount of fertiliser imported into the country (Shula, 2015).

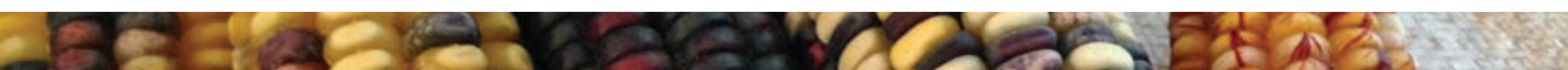
The private sector faces several sale and distribution challenges, such as the poor state of the road network (RMC, 2010). Transport is the biggest cost followed by transaction costs and trade margins—together they can comprise 37% of total cost. The balance consists of international costs. The poor condition of port and road infrastructure adds to delays in getting fertiliser to farmers in time (IFDC, 2013).

### Policy and governance terrain

The NAP proposes a diverse set of interventions on soil fertility, promoting “environmentally friendly farming systems such as conservation farming, afforestation, and the use of green manure and lime; encouraging farmers to use relatively cheaper sources of soil nutrients, including fertiliser blends, inorganic fertilisers, and liquid fertilisers as a way of reducing the cost of production and encouraging optimal application of fertiliser” (MACO, 2011:16). The NAP further promotes “expansion of production of oil seed crops (soya beans, sunflowers, groundnuts) in rotation with food grains as a way to reduce fertiliser costs on the one hand and increase farm yield, incomes and consumption of protein rich food crops on the other” (MACO, 2011:16) and says it will encourage “decentralised production and marketing of alternative sources of soil nutrients, such as fertiliser blends, liquid fertiliser and inorganic fertiliser” (MACO, 2011:17). In practice, however, most resources are dedicated to the input subsidy programme as indicated earlier.

ZARI’s SWMD is the primary institution responsible for overseeing soil health in Zambia (RMC, 2010). SWMD is one of four technical divisions with research programmes on soil, agroforestry and irrigation engineering (ZARI, 2015). It is responsible for developing and promoting appropriate soil and water management technologies that support

85. [http://www.norway.org.zm/News\\_and\\_events/Older-News-and-Events/Norwegian-fertiliser-company-Yara-coming-to-Zambia/#.VfE3P\\_SpfVI](http://www.norway.org.zm/News_and_events/Older-News-and-Events/Norwegian-fertiliser-company-Yara-coming-to-Zambia/#.VfE3P_SpfVI).





sustainable crop production and prevent environmental degradation. Its primary activities include researching and promoting the use of organic and inorganic fertilisers, promoting the use of inoculants in soya bean production, evaluating soil types, and there is some focus on conservation farming. It has created a soil inventory database, trains extension officers and farmers in soil sampling techniques, and oversees about 3 000 on-farm demonstrations of agroforestry technologies. The division also offers soil sampling services. Soil analysis tends to be demand-driven and is mainly for small-scale as opposed to commercial farmers (RMC, 2010).

The SWMD collaborates with international research institutions such as the Research Institute for Nature and Humanity at Kyoto University and the Japanese International Cooperation Agency (JICA). It works with the Department of Agriculture to survey soils on lands allocated to the Farm Block Development Programme (RMC, 2010). It is part of the Soil Fertility Consortium in Southern Africa, a member of the steering committee of the SADC Land and Water Management

Programme, and participates in regional research efforts funded by the International Development Research Centre (IDRC), as well as the SADC Fund for Innovative and Collaborative Research Projects (FIRCOP) regarding the promotion of conservation agriculture (ZARI, 2015).

According to Robson Nyirenda of Kasisi:

*The drive for chemicals, fertilisers, herbicides, it's mostly coming through agencies, like USAID and the EU. And the government ... because they can get the funds they just support these things. The promotion is not so much through the big companies, it's more through the development agencies. Because of course in the beginning the big industries are not willing to push these products because they won't make a profit in the beginning, so they are not willing to go and spend money. They have to look for tax payers' money somewhere and that's who is pushing this change in agriculture here in Zambia.<sup>86</sup>*

### **AGRA's Soil Health Programme (SHP)**

AGRA's Soil Health Programme (SHP) absorbed around 22% of AGRA grants to Zambia from 2007–2012 (Appendix 2). Only three grants were awarded: two to ZARI, worth US\$ 1.54m (80% of SHP grants) and one to UNZA for the remainder. The programme promotes the use of ISFM accompanied by the application of synthetic fertilisers. ISFM is defined as “a set of practices that include the use of fertiliser, organic inputs and improved germplasm” (Vanlauwe and Zingore, 2011). Practices include combining the use of mineral fertilisers, amendments such as lime or rock phosphate and organic matter; agroforestry, crop rotation and intercropping with legumes and conservation farming (AGRA and the International Institute of Rural Reconstruction (IIRR), 2014).

Implementing the system requires a degree of technical knowledge and the ability

86. Interview, Robson Nyirenda, Training and field extension, KATC, Chongwe, 6 June 2015



to ascertain the quality of soil and its requirements. In Africa, soil fertility status varies considerably even within very short distances (Vanlauwe and Zingore, 2011). In other words, even on the same smallholding, different practices may need to be put in place simultaneously. AGRA notes that in order to adopt this system and see an improvement in the soil requires financial resources, access to farm inputs and produce markets, in order to sell the expected surplus, which will fund the cost of the inputs (Vanlauwe and Zingore, 2011).

AGRA granted the ZARI a grant of US\$ 459 000 in 2010 for a three-year research programme working with small-scale farmers on farm productivity, arising from better fertiliser and liming recommendations (AGRA, 2015c). ZARI's other grant of US\$ 1.1m worked on the integration of legumes in maize-based cropping systems with small-scale farmers. ZARI trained over 30 000 farmers in these techniques (AGRA and IIRR, 2014).

According to Petan Hamazakaza at ZARI's Kabwe Research Station, the AGRA-sponsored projects also promoted the production of soya beans and rice. The project established 21 agricultural camps that trained 1 176 farmers, who were expected to train 15 others each on ISFM techniques, using soya bean production (AGRA and IIRR, 2014). Hamazakaza says the relationship was good, because the support was comprehensive and included finance, equipment and technical aspects. AGRA funded researchers from other countries to work as experts on the project in Zambia, to build research capacity in Zambia.<sup>87</sup>

UNZA received AGRA funding to build a soil testing laboratory, and sponsored 10 MSc students and six laboratory assistants. As a result, UNZA increased the number of samples tested to over 2 000 a year and earns an income from this (AGRA and IIRR, 2014).

In 2013 AGRA funded the establishment of the ZSHC, coordinated by IPNI, to provide a national forum to address soil health issues (ZSHC, 2015). This consortium forms part of

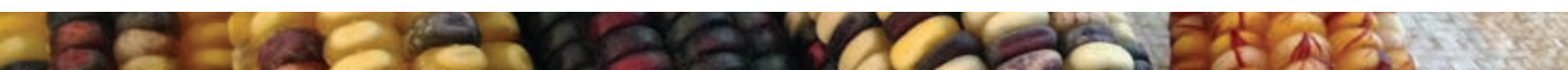
the wider regional group, the Soil Health Consortia for Eastern and Southern Africa, and the African Soil Health Consortium at the continental level. The Zambian consortium brings together a variety of players working on soil issues in Zambia, including ZARI, GART, the CFU, and UNZA, along with NGOs and private sector seed and fertiliser companies (IPNI, 2013). According to Daniel Kalala at Kasisi,<sup>88</sup> the ZSHC predominantly consists of soil scientists, experts from seed companies, and the national research institutions. Its focus areas are research and policy; extension, training and market access; policy, advocacy and communication; monitoring and evaluation; and resource mobilisation. ZARI at Mount Mukulu provides the secretariat, which is coordinated by the Head of the Soil System's and Plant Nutrition section.

Kalala goes on to explain that the ZSHC is premised on the fact that there are so many organisations, agencies and industries that work at all levels within Zambian agriculture, giving farmers mixed messages. ZSHC is mandated to reconcile all these different approaches, including consideration of the context-specific socio-economic situation, and to repackage appropriate information and technology for each specific context. The first phase is desktop research-based, collecting and synthesising available information on the different areas, to make policy recommendations and identify research gaps. The current AGRA grant is coming to an end and it is intended that government will assume funding of the ZSHC.

ZSHC aims to work with the government's agriculture extension department to take the repackaged solutions that are recommended for each area, to the farmers. We have noted that this sounds like a top-down transfer of technology approach, with limited grassroots input regarding construction of the technological package. However, we would need to do more primary research to see how the technologies are repackaged and offered to farmers.

87. Interview, Petan Hamazakaza, Principal, ZARI, Kabwe Research Station, 26 June 2015

88. Interview, Daniel Kalala, Research Coordinator, KATC, Chongwe, 8 June 2015.





According to Kalala, soil fertility technologies are promoted in isolation from one another: “Either organics, or conservation farming or conventional with promotion of fertiliser and herbicides. From a scientific point of view an integrated approach gives the best results. This also takes into consideration the environment, social, cultural and even economic setup.” Kalala supports the ISFM approach, opening the door to synthetic fertilisers but as part of a larger package of sustainable techniques. He says there is a growing realisation, even in the private companies, and agreement that synthetic fertilisers can have a negative impact on the soil, especially if overused, on acidity and micronutrients. At the same time sustainable technologies often release nutrients much more slowly so synthetics are part of the package. In all circumstances the addition of organic content is required. Kalala proposes that government should not only subsidise synthetic fertiliser but adopt a more balanced approach that promotes other technologies as well, including organic content, seed for green manure crops and agro-forestry species. He says that politically it will be difficult to dislodge FISP, but ISFM “is quite a good balance because it doesn’t mean that the government has to abandon its fertiliser support programme. The ISFM can just be added to this programme”.

## Conservation farming

Conservation agriculture, or conservation farming as it is named in Zambia, is based on three primary principles: minimal mechanical soil disturbance, permanent organic soil cover and crop rotation. In Zambia conservation farming is generally considered a success story for sustainable agriculture. This farming approach has the ability to increase productivity by improving the water retention capacity of the soil, fix nitrogen and decrease fuel use and soil erosion. Farmers using these methods in Zambia practice reduced tillage on no more than 15% of the field area without soil inversion; precise digging of permanent planting basins or ripping of soil with a Magoye Ripper and draft animals; leaving crop residues on the field instead of burning them; rotating cereals with legumes; and dry season land preparation (Arslan, *et al.*, 2014).

Conservation farming was first introduced to Zambia in the 1990s. When farmers adopting the technologies experienced maize yields of 6–8 t/ha, ZNFU was inspired to promote the approach. Conservation farming may provide security against the delayed onset of rains and highly variable rainfall patterns, making it suitable for mitigating the effects of climate change (Arslan *et al.*, 2014). The 2015 national Budget allocated funds to increase support for conservation farming to reach 84 000 farmers in 31 districts (Shula, 2015). However, uptake by farmers has not been as rapid as expected. In 2004, 13% of households were practicing some form of conservation farming, but by 2008 this had decreased to 5% (Arslan *et al.*, 2014). There are a variety of reasons for this: it can be costly, it requires specialised knowledge and increased labour.

According to Arslan *et al.* (2014) lack of access to credit is one of the most often cited constraints to the adoption of conservation farming in Zambia. Farmers need to learn new practices, without access to insurance if they fail; it is therefore potentially a risky undertaking for a risk-averse sector. In addition, the initial investment costs for cover crop seed, herbicides and sprayers are high and benefits are usually realised only after four years. There are also increased labour requirements for weeding if farmers do not use herbicides, and this places a constraint on rural small-scale and subsistence farmers, particularly women-headed households. Cover crop seeds are also not easily available to this group and using the crop residue as mulch takes this resource out of the mix for livestock feed and fuel. Tenure on customary land with traditional patterns of burning or allowing livestock to graze freely can also affect the adoption of this approach. Zambian studies indicate that the reach and quality of extension services also plays a role in adoption of this practice.

A number of organisations promote conservation farming in the country, including programmes funded by grants from international organisations, such as USAID, government programmes and local NGO initiatives. Both Concern and CFU actively promote conservation farming. Carl Wahl of Concern explains how they started, in 2010, with prescriptive technologies: basins, hybrid





seed, fertilisers, and legume-maize intercrops. But he says practice informed them that the emphasis should be on soil cover for water conservation.<sup>89</sup> Wahl says that Concern promotes synthetic fertiliser for hybrid maize because the soil is so poor that without synthetic fertiliser, farmers will spend months of hard labour for minimal yields. At the same time, he says, fertiliser is not cardinal to Concern's programmes and their main strategy is the promotion of legume intercropping and rotations.

The CFU's focus is on minimal tillage, with hoes, oxen or mechanised methods, basins or ripping.<sup>90</sup> They are currently promoting ripping for oxen and extending this into a business so that oxen owners can become service providers to rip the land of those who do not have oxen. CFU promotes mechanized ripping where possible, following the example of some countries like Kenya, where a lot of tractors go round the countryside as service providers. Says Rosie Pilcher of CFU: "Ripping is comparatively cheap compared with ploughing. And it's a way to encourage people to convert to conservation farming by just hiring someone else to rip their land rather than having to do it by hand." The standard challenges of limited biomass, apart from maize residues, and termite and animal consumption apply in Zambia as elsewhere in the region. CFU is based in Zambia but also works in Malawi with Total Land Care, in Kenya with Participatory Approaches for Integrated Development (PAFID) and Tanzania with the Hanns R. Neumann Stiftung (HRNS) and the Gatsby Trust.<sup>91</sup>

Other organisations more opportunistically see conservation farming as a potential new market opportunity:

*Agro-dealers teach these technologies [conservation farming] because some of those elements would then be bought*

*from the shop. If you teach the farmers that they should be integrating their crop with a legume, you are creating demand for legume seed that you can sell in your shop. Or if we say you should not plough, you can then create the demand for the herbicides. So that's how we interface. We call them 'demand creation activities', which activities can an agro-dealer do that can create demand which will result in a sale?<sup>92</sup>*

CA is closely associated with the more recent CSA. Most mainstream proponents of both CA and CSA tend to adopt an integrated approach to the core principles, with many supporting the use of synthetic fertiliser and pesticides. Herbicides are often included in Green Revolution packages, which forces farmers into adopting these poisons.<sup>93</sup> Minimum tillage means soil is not turned over so it can become harder to deal with weeds. While weeding is relatively straightforward on small plots, as size expands it becomes less feasible.<sup>94</sup> According to Vince Hodson at CFU, while they do not actively promote herbicide use, "it is being used and it is a reality that it decreases labour intensity and cost. Herbicide is about a third or half of the price of land labour",<sup>95</sup> and the time required for application can be a tenth of the time required for hand weeding.

Charles Nkhoma of CTDT says:

*Thirty to forty years ago, fertilisers were so cheap everyone could afford them. Now that farmers are dependent on them and the soils are so degraded, farmers can't farm without them. Now the same thing is going to happen with herbicides. It's relatively very cheap now, but 20 years from now, farmers will be crying for herbicides like they are for fertilisers now. They will have forgotten the stage when they managed to farm without herbicides*

89. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

90. Interview, Rosie Pilcher, general administration, CFU, Lusaka, 6 July 2015

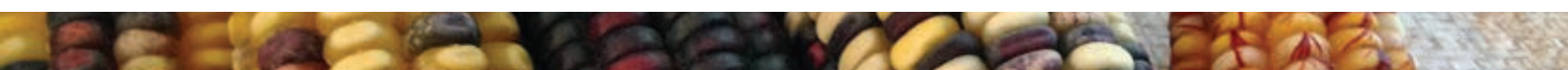
91. Interview, Vince Hodson, Senior staff and technical advisor, CFU, Lusaka, 6 June 2015

92. Interview, Peter Manda, Director, NAT, Lusaka, 14 July 2015

93. Interview, Susan Chilala, Secretary, RWA Zambia, Lusaka, 11 June 2015

94. Interview, Rosie Pilcher, general administration, CFU, Lusaka, 6 July 2015

95. Interview, Vince Hodson, Senior staff and technical advisor, CFU, Lusaka, 6 June 2015



*... Once farmers are dependent on herbicides, if a company comes along and says they have a solution to the problem of herbicides sometimes damaging the maize—how can farmers refuse? It will be very simple for Monsanto to promote the use of GM with the support of farmers now.*<sup>96</sup>

The indiscriminate use of pesticides poses ecological and health hazards. Ecologically it is known to damage the habitat, reducing biodiversity above and below the soil with far-reaching consequences on the ecosystem balance.

According to Carl Wahl at Concern: “Usually people have no idea what they are doing when applying pesticides and herbicides. They spray for spider mites and end up killing everything that would eat the spider mites and the mite population just explodes.”<sup>97</sup>

Rosie Pilcher at CFU agrees: <sup>98</sup>“There are now hundreds of different types [of pesticides and herbicides] from all over the world and people are not trained on how to use them. Agro-dealers are selling these products without knowing anything about them.” As a result training is oriented towards safety, correct quantities, timing of the applications, and so on.

Vince Hodson argues: “We really have an obligation to train farmers in the safe use of herbicides. There are so many different products out there that farmers have no idea how to use or what they are. We feel it’s a duty that we must train them. But we understand that in doing so we are also creating a market. It almost overtook us because it expanded so fast. So now we are doing training with all our staff, on every single herbicide that is available to small-scale farmers.”

Robson Nyirenda of Kasisi says: “Seven years ago, the Ministry of Agriculture through some agencies were demonstrating on the use of herbicides. Farmers were resisting it completely. Right now, farmers are more inclined to getting the herbicides, and this happened through the continuous demonstration plots, the continuous promotion, continuous pumping in of financial support for this.”<sup>99</sup>

One might imagine that at least some of the resources being used to support farmer-to-farmer sharing and capacity building regarding on-farm pesticide manufacture is based on ecological agriculture and biological controls. It must be acknowledged, at the same time, that this is a knowledge intensive practice and requires ongoing close management. It may not be possible or even advisable for everyone.

96. Interview, Charles Nkoma, Director, CTDI, Lusaka, 10 June 2015.

97. Interview, Carl Wahl, Conservation Agriculture Coordinator, Concern Zambia, Lusaka, 10 July 2015.

98. Interview, Rosie Pilcher, general administration, CFU, Lusaka, 6 July 2015.

99. Interview, Robson Nyirenda, Training and field extension, KATC, Chongwe, 6 June 2015.



## CONCLUSIONS AND FURTHER RESEARCH

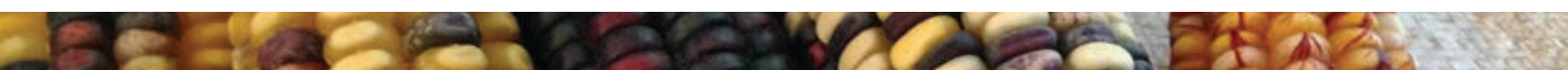
Zambia has gone a long way down the Green Revolution path, in particular the huge outlay of public resources to sponsor FISP and the FRA. These programmes have influenced production patterns and oriented farmers towards hybrid maize in particular. This has come at the cost of diversity in production, the undermining of traditional seed varieties, marginalised agro-ecological production practices, and has created a technological treadmill on which farmers are forced to keep using these technologies—even if the results are mediocre. Farmers in Zambia are increasingly dependent on subsidised inputs over which they have no control, because the inputs rely on capital-intensive production processes and expertise. Even though there is widespread recognition of the limits to the long-term sustainability of the subsidised input route, even politicians have become dependent on the structure. It will be difficult to move away from this approach in the short term, despite the fact that farmers remain as deeply mired in poverty, after more than a decade of subsidies, as they were before. Consequently, intermediate strategies may be required such as the need to diversify resources so as to support other possibilities and alternatives to the purely Green Revolution package.

AGRA's role in Zambia is contradictory. On the one hand, it is investing resources in building public sector capacity in plant breeding and ISFM, which may have its benefits. On the other hand, AGRA functions in such a way that it lays the ground for the entry of MNC agribusinesses that extract value at the expense of farmers. It has also elected to build private, for-profit agro-dealer networks that operate on a top-down model of technology transfer with limited farmer participation in technology development, rather than investing in bolstering public sector extension capacity. Demo plots and farmer field schools tend to demonstrate pre-determined technologies instead of providing farmers with a diverse range of options that they can choose from. Systematic assessments of AGRA's work on the ground are scarce. We are less interested in the

numbers of farmers reached or even number of seed varieties developed and more interested in whether farmers find AGRA's contributions to add value to their activities. Anecdotal evidence from Zambia and elsewhere suggests that the agro-dealer networks are expensive and do not offer farmers an adequate service. They may be other ways of doing outreach that are more cost-effective and responsive to farmers' needs.

As indicated, from a seed point of view the focus is almost exclusively on hybrid maize. Efforts to diversify R&D to cover different crops should be supported. Efforts by AGRA and others in the Green Revolution stable to privatise the production of certified seed, and suggestions that this is the only viable option for the expanded availability of quality seed. However, on the one hand, there is a growing recognition that an exclusive focus on hybrid maize is detrimental in the long run, and there are efforts to build public sector breeding capacity. On the other hand, regional seed harmonisation processes sever these positive developments by making it far simpler for MNCs located outside Zambia to breed and register seed in countries where they are already established, and then simply bring them into Zambia through regional channels. This is the opposite to the stated effect that PVP and the protection of proprietary IP will give the private sector greater confidence to invest in plant breeding in all countries in the region. Associated with this, the push to marginalise the public sector regarding seed multiplication, in favour of private commercial enterprises, also opens the door for the acquisition of domestic seed companies by MNCs. There is ample evidence of this in the region, with negative impacts on the Zambian seed sector. For example, the acquisitions of SeedCo, Pannar and MRI by US and European corporations in recent years, has witnessed the concentration of control of the seed sector in Zambia by foreign corporations.

While stringent quality controls and standards for the formal sector are important to protect farmers from opportunistic behaviour, the formal system may also benefit from greater flexibility to enable farmers to produce and share quality seed in their own localities. Large-scale corporations tend to prefer standardised and uniform technologies across large areas,



to generate the necessary economies of scale for them to recoup their investments and make a profit. As such, smaller, more localised pockets of demand are bypassed. The seed laws make it difficult for smaller players to fill these localised gaps because they must go through the same procedures and pay the same fees as the multinationals. On top of this, the seeds being produced by MNCs are directly and indirectly subsidised through FISP, the FRA and the many PPP breeding support programmes that operate in Zambia.

The above speaks only to farmers who want to produce certified seed for sale. But there is also the far larger, but side-lined and ignored, demand for a vast array of locally-adapted seed varieties of many less commercially important crops, which are not necessarily in need of formal certification. There are few programmes or resources directed towards supporting in situ seed enhancement and quality control, managed by farmers themselves, to meet their own and their neighbours' needs. There is no good reason why these activities should be subjected to stringent formal certification systems or even criminalised. Such subjection can only lead to the collapse of biodiversity, poorer nutrition for rural and farming households in particular, loss of resilience and the increasing brittleness of rural livelihoods. Diversified programmes are needed that cater for diversified programmes that cater for these more localised seed enhancement and distribution processes, that support farmers' control over these processes, and link public sector R&D and extension with farmers' priorities and practices to build localised systems, introducing non-proprietary germplasm and expertise as required.

Concerning soil fertility we again confront the dominance of the FISP package that orients farmers towards synthetic fertiliser use, based on uniform, blanket offerings. It may be true that Zambia's yields have increased since the FISP programme (though by all accounts this is not by a significant amount). However, this has come at the cost of a crippling dependency which forces farmers onto a treadmill on which declining soil quality must be countered with

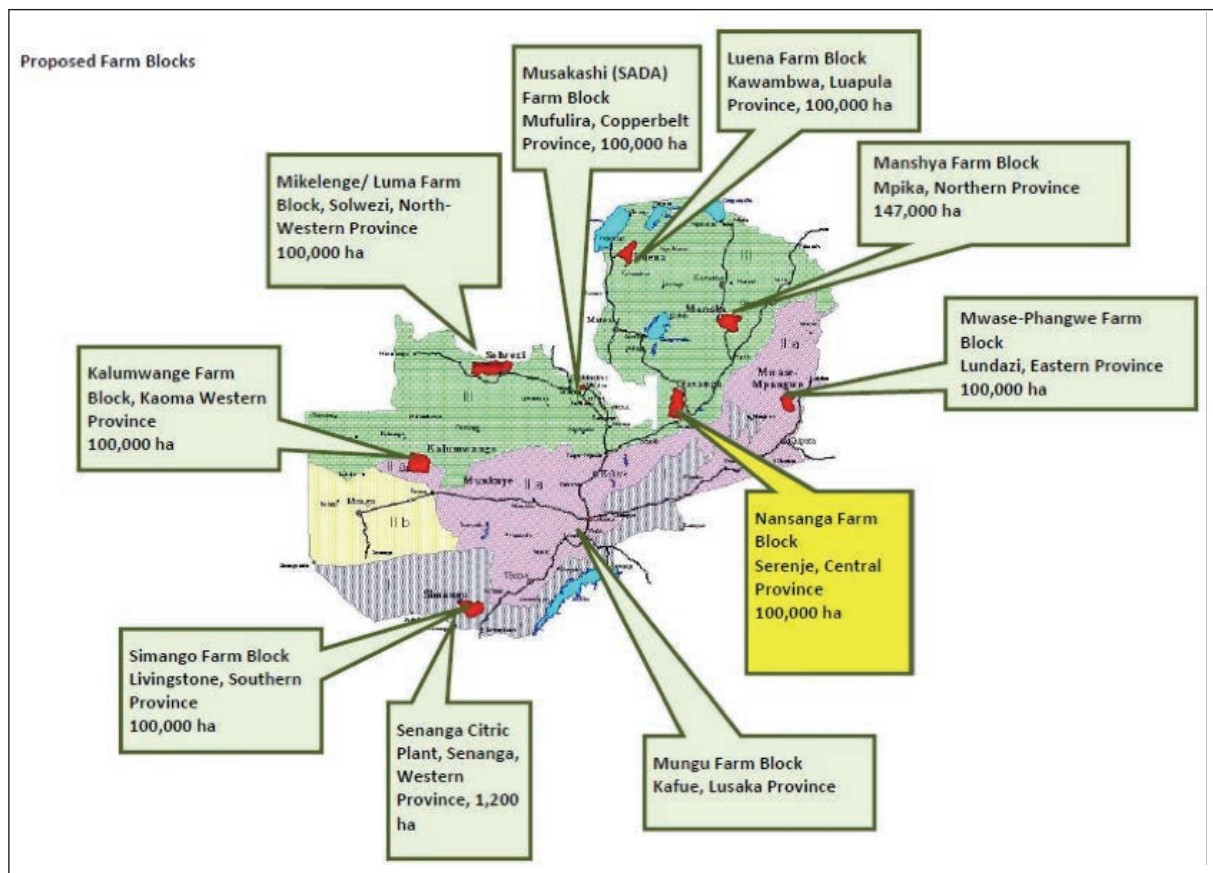
greater application of (subsidised) fertiliser, which in turn leads to a further decline in soil quality, in a vicious cycle. This is not to say that no external nutrients are ever required. However, more information is required on context-specific nutrient requirements that can allow for the development and delivery of a tailored product to suit the local conditions. This is much more difficult than the mass distribution of a uniform NPK product, but it is far more sustainable in the long term.

Farmers have lost control of soil fertility management, with decisions being made by experts from outside and products being foisted on farmers that are not necessarily appropriate to their conditions. A potentially fruitful path of investigation could be to identify and share simpler methods and technologies that farmers can use to assess nutrient requirements in situ, on their own plots, and also to start the search for required nutrients from the locality first, before jumping immediately to the global level. There is general agreement, even amongst private fertiliser companies, that the addition of organic content is an essential ingredient. To some extent, CA and ISFM try to encourage practices of increasing organic content, especially through the use of crop residues for mulch. But there is also a tendency to lean towards synthetic fertilisers as a quick fix, or to promote the use of herbicides which destroy biomass and poison the ecosystem. There are certainly challenges to increasing the organic content of the soil. It is labour intensive and often elderly people or women are tasked with this work, in addition to their other daily tasks. Biomass may be limited apart from maize residues, which are regularly consumed by termites and livestock. Animal manure, a key source of nitrogen, is in short supply, especially since agricultural liberalisation which saw the decline of essential public services (e.g. dipping) which has seen a precipitous drop in the number of animals. Ultimately there may be a need for some external inputs in some conditions, but this should be judicious, context-specific, and embrace the promotion of many technologies, not just one.





## APPENDIX 1: Zambia's farm blocks



Source: Zambia Development Agency.

## APPENDIX 2: AGRA grants in Zambia, 2007–2012

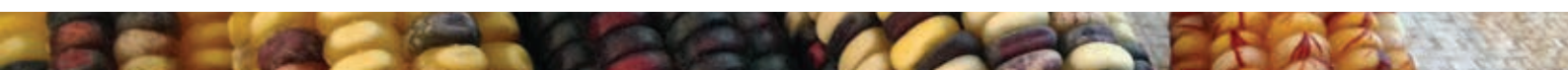
Source: AGRA grants database <http://www.agra.org/agra/en/grants/grants-information-database/>

**Table 2A: Programme for Africa's Seed Systems (PASS) grants, 2007–2012**

Programme	Dates	Amount (US\$ '000)	Recipient	Description
SEPA	2008–10	166	Kamano Seed Co	To produce and supply improved seeds of maize, beans, sorghum, groundnuts and cowpeas to small-scale farmers in Zambia to enable them to improve their productivity and incomes thereby reducing poverty
SEPA	2009–11	170	International Development Enterprises (IDE)	To promote the availability of improved seed in seven districts of Zambia so as to enable smallholder farmers to have increased food productivity, household food security and income
SEPA	2010–13	211	Kamasika Seed Growers Association	To improve the food security and household incomes of smallholder farmers of the Kaoma district of Zambia through the provision of improved seeds of maize, sorghum, beans, cowpeas and groundnuts
SEPA	2010–13	200	Indigenous Seed Co	The production and dissemination of the improved seed of maize, beans, sorghum, groundnuts, soya beans, finger millet, okra, and cowpeas, to poor, smallholder farmers in the Northern, Central, Lusaka, Eastern and Southern provinces of Zambia, so as to achieve increased yields, food security and better livelihoods, at the household, national and regional levels
SEPA	2011–13	158	Stewards Globe Limited	To increase food security and the incomes of smallholder farming communities in the Central and Lusaka Provinces of Zambia, by enhancing their access to improved seed varieties and the production capacities of sorghum, beans, soya beans and cowpeas
SEPA				
<b>Sub-total SEPA</b>		<b>905</b>		



Programme	Dates	Amount (US\$ '000)	Recipient	Description
FIAAC	2008–12	185	Seed Control and Certification Institute (SCCI)	To increase on-farm productivity and reduce rural poverty by providing the resource-poor farmers of Zambia with new improved maize varieties that are resistant to drought and low nitrogen
FIAAC	2010–13	185	Zambia Agriculture Research Institute (ZARI)	To improve food security among smallholder farmers in Zambia through development of upland rice varieties with improved resistance to blast and tolerance to aluminum toxicity
FIAAC	2010–13	185	ZARI	To improve productivity and increase incomes for smallholder farmers in Zambia, through breeding and promotion of high yielding, high dry matter and better carotene-rich sweet potato genotypes, with consumer preferred characteristics
FIAAC	2012–15	150	SCCI	To improve the food security and livelihoods of small-scale farmers in Zambia through breeding maize with high yield potential, drought tolerance and low nitrogen stress
<b>Sub-total FIAAC</b>		<b>705</b>		
EACI	2011–13	394	University of Zambia (UNZA)	To improve the productivity and incomes of smallholder farmers in the SADC region through strengthening capacity for plant breeding and improved seed systems
<b>Sub-total EACI</b>		<b>394</b>		
ADP	2008–11	3 053	Cooperative for Assistance and Relief Everywhere (CARE)	To provide 91 000 smallholder farm households in remote rural Zambia with an increased range of agricultural inputs and technologies at reduced end prices by extending the network of agro-dealers through community agents and service providers
ADP	2011–13	328	Nutri-AID Trust Ltd	To improve agricultural productivity among smallholder farmers in three districts of Zambia and contribute to increased household incomes and reduced poverty levels, through the development of a strong, sustainable network of agro-dealers that will offer cost effective agricultural inputs
<b>Sub-total ADP</b>		<b>3 381</b>		
<b>Total PASS</b>		<b>5 385</b>		



**Table 2B: Soil Health Programme (SHP) grants, 2007–2012**

Programme	Dates	Amount (US\$ '000)	Recipient	Description
Extension	2010-13	1 081	ZARI	To improve soil health, food security and the incomes of smallholder farmers through the integration of legumes in maize-based cropping systems in Zambia
Research	2010-13	459	ZARI	To improve smallholder food security, nutrition and income through increased farm productivity from better fertiliser and liming recommendations
Training	2011-13	371	UNZA	To provide post graduate training in ISFM and enhance laboratory services in order to improve smallholder agricultural production systems in Zambia
<b>Total SHP</b>		<b>1 911</b>		

**Table 2C: Other grants, 2007–2012**

Programme	Dates	Amount (US\$ '000)	Recipient	Description
PPP Investments	2011-14	518	Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA)	To promote growth in production and inter-regional trade of food staples by increasing information exchange between regional governments, food aid agencies, and the private sector
Markets	2012-15	949	Frontier Development Associates	To enhance smallholder farmers' access to output markets by strengthening their organizations, improving produce storage systems and their participation in structured trading system resulting in increased incomes and better livelihoods
<b>Total other</b>		<b>1 467</b>		
<b>TOTAL</b>		<b>8 763</b>		

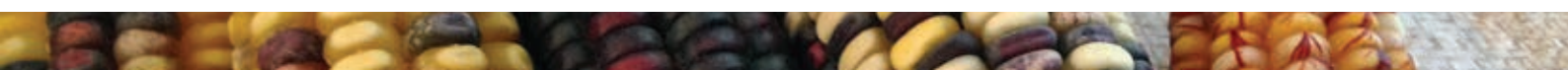




## APPENDIX 3: Farmer-managed seed projects in Zambia

Project	Donor	Coverage	Crops	Type of project
Southern Province Household Food Security Program	IFAD	Southern Province	Cowpea, sorghum, sunflower, sesame, groundnut, bambaranut, sweet potato	Seed growers trained in each district. Project buys seed from them, distributes to village seed committees
Luapula Livelihood and Food Security Program	FINNIDA	Luapula Province	Beans, sorghum, finger millet, rice, groundnut, cassava, sweet potato	Farmers loaned seed for multiplication, and encouraged to sell seed
Multiplication and Distribution of Seed/Planting Materials Project	SIDA	Northern, North-western, Southern and Western Provinces	Sorghum, pearl millet, finger millet, groundnut, cowpea	156 farmers trained in seed production; expected to become seed producers
Smallholder Farm Systems Diversification Program	UNDP	Eastern, Lusaka Central, Northern, Copperbelt and Luapula Provinces	Sorghum, finger millet, pearl millet, groundnut, maize, cowpea, beans, rice, soyabean, sunflower, cassava, sweet potato	164 farmers trained in seed production; expected to sell to other farmers or to merchants
Drought Rehabilitation Program	SIDA	Southern, Lusaka, Eastern, Western and North-western Provinces	Sorghum, cowpea, groundnut, pearl millet, cassava, sweet potato	Farmers trained as seed entrepreneurs; project also helps move seed between areas
Livingstone Food Security Program (CARE)	USAID	3 districts in Southern Province	Maize, sorghum, groundnut, bambaranut, millet, green gram, sunflower	Farmers being trained to be seed entrepreneurs
Bulima Seed Growers Association	EU	Mpongwe District, Western Province	Groundnut	Group has sold seed to various donor projects, also attempts its own marketing
International Union for Conservation of Nature (IUCN) Seed Multiplication Program	World Bank	Lukulo District, Western Province	Cowpea, sorghum, maize, rice	Farmers are loaned seed to multiply. Repay loan to project, which distributes to other farmers
Small-Scale Seed Production Project	GTZ	Southern Province	Maize, sorghum, pearl millet, cowpea, groundnut	As above
Chipata Diocese Development Project	Miserio (Catholic Church)	Several districts in Eastern Province	Groundnut, maize, sunflower	As above
Farming Systems Research Team	Govt of Zambia	Kaoma District, Southern Province	Cowpea, groundnut, sorghum, maize, pearl millet, cassava	Farmers multiply seed and are expected to sell it to others
Rural Community Development and Motivation Project	Lutheran World Fed.	Several districts in Eastern Province	Several crops	Seed is loaned to farmers and farmer groups for multiplication

Source: Zulu and Miti (see Appendix)

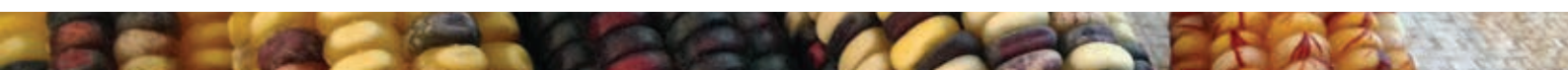


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