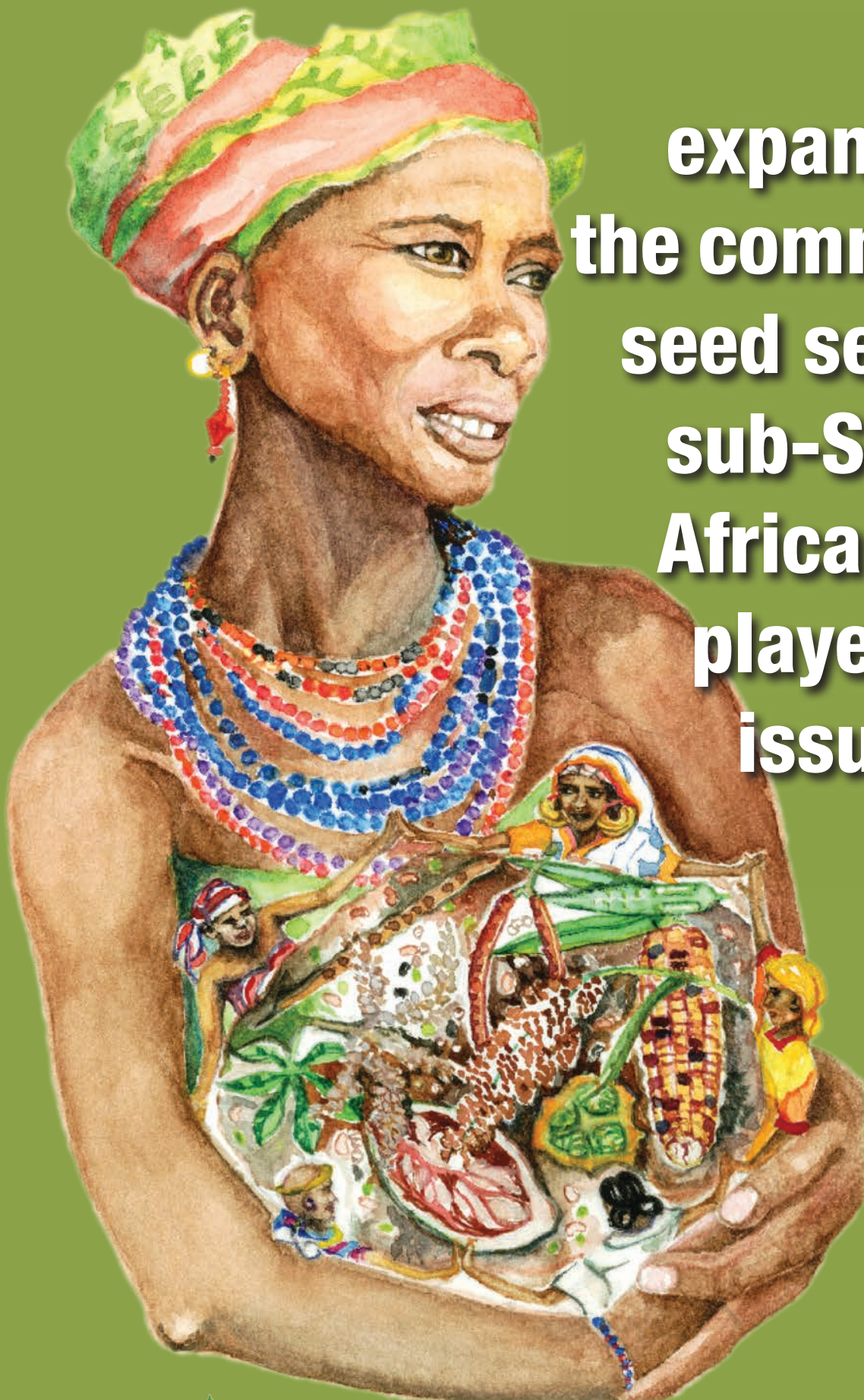


The expansion of the commercial seed sector in sub-Saharan Africa: Major players, key issues and trends

November 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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ACRONYMS and ABBREVIATIONS

AATF	African Agricultural Technology Foundation
AATIF	African Agriculture and Trade Investment Fund
ACB	African Centre for Biodiversity
ACTESA	Alliance for Commodity Trade in Eastern and Southern Africa
ADDP	Agro-dealer Development Programme
AECF	African Enterprise Challenge Fund
AFSTA	African Seed Trade Association
AfDB	African Development Bank
AGRA	Alliance for a Green Revolution in Africa
AMSAP	Advanced Maize Seed Adoption Programme
APSA	Asia-Pacific Seed Association
ARIPO	African Regional Intellectual Property Organisation
ASA	Agricultural Seed Agency (Tanzania)
ASIESA	Alliance for the Seed Industry in Eastern and Southern Africa
ASIF	African Seed Investment Fund
ASIWA	Alliance for Seed Industry in West Africa
ASSMAG	Seed Multiplication Action Group (Malawi)
ASTA	American Seed Trade Association
AU	African Union
AUC	African Union Commission
AVRDC	World Vegetable Centre
BAMB	Botswana Agricultural Marketing Board
BMGF	Bill and Melinda Gates Foundation
CAADP	Comprehensive Africa Agriculture Development Programme
CAC	Competition Appeals Court (South Africa)
CGIAR	Consultative Group on International Agricultural Research
CIFOR	Center for International Forestry Research
CIMMYT	International Maize and Wheat Improvement Centre
CIP	International Potato Center
COMESA	Common Market of Eastern and Southern Africa
CPVO	European Community Plant Variety Office
CSOs	Civil Society Organisations
DfID	Department for International Development (United Kingdom)
DTMA	Drought Tolerant Maize for Africa
DRC	Democratic Republic of Congo
DUS	Distinct, Uniform, Stable
EACI	Education for African Crop Improvement
ECOWAS	Economic Community of West African States
EASCOM	Eastern Africa Seed Committee
EGS	Early Generation Seed
EU	European Union

FAO	Food and Agriculture Organisation
FIACC	Fund for the Improvement and Adoption of African Crops
FICA	Farm Inputs Care Centre
FIPS	Farm Input Promotions Africa Limited
FISP	Farm Input Subsidy Programme
G8 NAFSN	G8 New Alliance on Food Security and Nutrition
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GLDB	Grains and Legumes Development Board
GM	Genetically Modified
GMO	Genetically Modified Organism
GNIS	Groupement National Interprofessionel Semences et Plants
ICARDA	International Center for Agricultural Research in the Dry Areas
ICRAF	International Council for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid-Tropics
IFDC	International Fertiliser Development Centre
IITA	International Institute for Tropical Agriculture
IP	Intellectual Property
IPRs	Intellectual Property Rights
IRRI	International Rice Research Institute
ISF	International Seed Federation
ISSD	Integrated Seed Sector Development
ISTA	International Seed Testing Association
KARI	Kenyan Agricultural Research Institute
KSC	Kenya Seed Company
MAFSC	Ministry of Agriculture, Food Security and Co-operatives (Tanzania)
MOU	Memorandum of Understanding
MRI	Maize Research Institute
NARS	National Agricultural Research System
NEPAD	New Economic Partnership for Africa's Development
NIRSAL	Nigerian Incentive Based Risk Sharing System for Agricultural Lending
NSCM	National Seed Company of Malawi
OAPI	Organisation Africaine pour la Propriété Intellectuelle
OPV	Open Pollinated Variety
PASS	Programme for Africa's Seed Systems (AGRA)
PBRs	Plant Breeder's Rights
PVP	Plant Variety Protection
QDS	Quality Declared Seed
R&D	Research and Development
RSMA	Rhodesia Seed Maize Association
SADC	Southern African Development Community
SAGCOT	Southern Agricultural Growth Corridor of Tanzania
SANSOR	South African National Seed Organisation
SEPA	Seed Production for Africa
SEVIA	Seeds of Expertise for the Vegetable Sector of Africa

SFSA	Syngenta Foundation for Sustainable Agriculture
SIDA	Swedish Development Cooperation Agency
SSA	sub-Saharan Africa
SSTP	Scaling Seeds and Technologies Partnership (AGRA)
STAG	Seed Trade Association of Ghana
SUA	Sokoine University of Agriculture
TOSCI	Tanzania Official Seed Certification Agency
UN	United Nations
UN FAO	United Nations Food and Agriculture Organisation
UNDP	United Nations Development Programme
UPOV	International Union for the Protection of New Varieties of Plants
US	United States
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USPTO	United States Patent and Trademark Office
WARDA	West Africa Rice Development Association
WASA	West Africa Seed Alliance
WASP	West African Seed Programme
WECARD	West and Central African Council for Agricultural Research and Development
WEF	World Economic Forum
WEMA	Water Efficient Maize for Africa project
WIPO	World Intellectual Property Organisation
ZSPA	Zambian Seed Producers Association

KEY FINDINGS

The private seed industry has made dramatic gains in sub-Saharan Africa in recent years. However, this seed industry is not a homogenous bloc, but consists of numerous layers of companies, including: the largest multinational companies, Monsanto, DuPont Pioneer, Syngenta and Vilmorin & Cie; another group of large multinational companies from Europe and Asia (many with a focus on horticulture); a group of large former national seed companies such as Zimbabwe's Seed Co, the Kenya Seed Company (KSC), and Zamseed and Tanseed of Zambia and Tanzania respectively; and a group of newly emerging local seed companies, many of whom have received support from the Alliance for a Green Revolution in Africa (AGRA).

Maize and horticulture are the two biggest seed markets on the continent, valued at around US\$ 500 million and US\$ 250 million respectively and there has been a heavy focus on these two markets by the private seed industry. The expansion of hybrid maize use is problematic for a number of reasons. Because it needs re-purchasing every year and the use of other agro-chemicals it is generally more costly and gives farmers less flexibility in their farming practices. Hybrid maize has also become integral to the recent resurgence in input subsidy programmes, which, while benefiting the large seed companies who provide the seed, has implications for agrobiodiversity, nutritional diversity and national agricultural budgets (significant amounts of which are spent on hybrid maize seed and accompanying chemical fertilisers). There are also challenges for small-scale farmers and seed companies around vegetable seeds, as the technical and financial requirements for seed production (including the need for specialist equipment) mean that the majority of vegetable seed is imported. Vegetable production for market also requires large capital investments, including greenhouse and irrigation equipment.

Seed industry activity is mostly concentrated in the Guinea-Savannah agro-ecological zone, a vast area stretching from the east coast to west Africa, identified as being of high

agronomic potential. AGRA's grants to seed companies have been spread across a number of these countries, but these investments have been principally concentrated in Tanzania, Ghana, Ethiopia, Nigeria, Zambia, countries which are also members of the G8 NAFSN or Grow Africa. These countries are also where the large multinationals are focusing their investments. Local companies are similarly looking to expand, and they have their sights on the Great Lakes region of Rwanda, Burundi and the eastern DRC -an area of particular interest. Zimbabwe, not part of AGRA or other Green Revolution initiatives for political reasons, has witnessed a wave of consolidation in its domestic seed industry in recent years.

AGRA has given support to 80 seed companies since it was established in 2006. Subsequently, a number of investment funds have been established (some funded by AGRA) to invest directly in African seed companies. Among the more significant of these are the African Seed Investment Fund (ASIF), the African Enterprise Challenge Fund (AECF) and Injaro Investments. These new investments, many of which are in companies that have previously been supported by AGRA, are typically in the form of loans or equity investments and are much larger than previous AGRA grants. This commercial focus is likely to mean a greater focus by these seed companies on a narrower range of commercially lucrative crops.

To support the expansion of the private seed industry on the continent, a raft of new policy and legal changes are on the table. Efforts are currently underway to introduce harmonised intellectual property rights (IPR) regimes via regional organisations such as the African Regional Intellectual Property Organisation (ARIPO) and the Organisation Africaine pour la Propriété Intellectuelle (OAPI). These harmonised laws are modelled on UPOV 1991, a legal framework developed in the global north where farming conditions are very different. Under a UPOV based model, common practices such as seed saving and exchange between farmers would be severely restricted.

Similar harmonisation initiatives are underway in the area of seed trade and certification, such as the Common Market of Eastern and Southern Africa (COMESA) Seed Trade

harmonisation regulations. Under these laws, any varieties that cannot conform to the 'distinct, uniform and stable' (DUS) test for the release of new plant varieties, which include all farmer, local varieties and landraces, cannot be legally registered and therefore their cross-border trade would be illegal. The SADC regional variety catalogue so far only contains hybrid maize varieties registered by Monsanto and Syngenta, suggesting that these initiatives will disproportionately benefit the larger seed companies. Even the World Bank has questioned the wisdom of introduction these harmonised seed trade laws.

The international donor community is highly complicit in the seed industry expansion in SSA, from the largest philanthropic organisations such as the Bill and Melinda Gates Foundation (BMGF) and the Rockefeller Foundations to national donors, such as the United States, the United Kingdom, the Netherlands, Denmark, Sweden, Germany and Australia. Many of these governments are actively involved in the G8 NAFSN and are also financially supporting many of the investment funds that are investing in the new Africa seed companies.

For the tens of millions of small-scale farmers in SSA these changes taking place in the seed industry are likely to have profound impacts. Farmers are expected to become more commercially orientated to cover the rising costs of inputs that will occur. No doubt a small-layer of farmers will be able to do this successfully, but what about resource poor farmers and those living in remote or ecologically harsh environments not suited to constantly producing for market? Even those who are able to successfully produce for market, will still be prone to climatic and marketing risks. The majority of farmers will also not have the means to engage in seed selection or production, should onerous certification laws being proposed become the norm throughout the continent. As private seed companies on the continent continue to grow and consolidate they are likely to focus on a narrower range of commercially lucrative crops when most people agree that seed systems in Africa will require more, not less, diversity going forward.

Use of terms

Improved varieties

Broadly speaking, an improved variety could include any crop variety for which some form of deliberate selection, or breeding together of different varieties, has been adopted in order to achieve desirable traits. Thus, crop varieties have been undergoing some form of improvement for the last 10 000 years. As this paper is focused primarily on the expansion of the private seed sector in Africa (and the laws and policies to facilitate this) the use of the term 'improved' seed or varieties refers primarily to those varieties that have been bred or selected, registered and certified under a formal system.

Informal or farmer managed seed systems?

In SSA the majority of seed planted by small-scale farmers has been selected and saved back from the previous year's harvest or sourced from neighbouring farmers in the local vicinity. Despite this, the literature refers to these systems as being 'informal', as opposed to 'formal' seed systems in which seed breeding, production and marketing is highly regulated. Informality implies something that is sub-standard and that must be ignored, radically overhauled, or eradicated altogether. We feel it far more appropriate to replace this with the term farmer-managed seed systems. This recognises that farmers are the primary agents in these systems and should be treated as equal partners in any attempts to support their farming practices.

INTRODUCTION

In the Green Revolution narrative of our time, the low adoption rates of 'improved' or certified seed from the formal sector in sub-Saharan Africa (SSA) is one of the major reasons for the low rates of agricultural productivity seen on the continent. In this paradigm the role of the private sector as a producer and distributor of seed is seen as key. Hence, recent interventions such as the Alliance for a Green Revolution in Africa (AGRA), the G8 New Alliance on Food Security and Nutrition, Grow Africa and many others place a heavy emphasis on developing and facilitating the role of the private sector in SSA's seed systems.

Coinciding with the rise of AGRA is a renewed focus from the international donor community on agriculture generally, particularly in SSA, in the context of the 2007–2008 food price crises and concerns over climate change. This has been accompanied by a dramatic change in the discourse around SSA generally, where the once 'hopeless continent' (The Economist, 2000) has now been described as 'the last frontier'. Africa is now attracting interest from traditional agribusiness corporations and newer sources, including a variety of financial vehicles, from private equity and venture capital to pension schemes, although most of these investments, so far, have been associated with land.

The objective of this paper is to give an overview of some of these interventions in the context of a highly coordinated Green Revolution push in SSA and to profile some of the activities of the major and emerging seed companies on the continent. From the start some context is required. Though figures vary widely by region and crop, most people agree that around 70–80% of the seed planted in Africa is from farm saved seed. In the case of maize, which has its own unique history on the continent, adoption of improved varieties covers approximately 33% of the area in Eastern Africa and 38% in Southern Africa (excluding South Africa) (Scoones & Thompson, 2011). In West Africa where, according to AGRA, the private seed sector was 'non-existent' (outside Nigeria) prior to its launch, adoption rates for improved varieties are generally lower than in the south and east (AGRA; 2013, p.61).

The main focus of this paper is the activities of the seed companies themselves. Whereas many of the activities such as breeding, seed production and marketing, are conducted by seed companies in the Global North, in SSA these are carried out by a variety of public, private and non-government organisations. Numerous policy interventions are underway to shift more of these activities to the realm of the private sector, but these moves are still underway. While many of these interventions have been covered in detail elsewhere, for the sake of contextual clarity some repetition will be necessary. We hope this will not distract too much from the main topic at hand.

The paper opens with a brief outline of the various seed systems in SSA, with more focus on the formal seed system; this is followed by a brief history of the maize seed industry in SSA, which should help to clarify the predominant role of maize seed companies in SSA at the present time. Thereafter the role of AGRA, as a major supporter of small and medium sized seed companies in SSA, is explored, together with the parts played by other investment vehicles in the seed industry.

Finally, a small note on the limitations of this study. Sub-Saharan Africa is a vast area of the continent and possesses a diversity of farming systems not found elsewhere. Agricultural data on the continent, although improving is still notoriously unreliable, while information specific to the topic (seed company market shares, for example) is generally not in the public domain. This should be borne in mind when such data is used; our intention is to trace some of the broad trends on the continent, rather than scrutinise the finer details of seed systems and seed companies in SSA.

OVERVIEW OF SEED SYSTEMS IN SUB-SAHARAN AFRICA

Seed systems in SSA are generally classified as being formal, semi-formal and informal, though a new discourse is emerging that calls the informal system a farmer managed seed system. In the majority of countries there is a significant degree of integration between these systems. Additionally, seed aid forms part of the system in a number of countries, including Burundi, the Democratic Republic of Congo (DRC), the Republic of Congo, Kenya, South Sudan and Zimbabwe (CTA, 2014). Seed systems can vary by type of targeted farmer (small-scale or commercial), crop production systems (self-pollinating, cross-pollinating, or vegetatively propagated crops), and geographic location.

Farmer managed seed systems

This is the predominant form of seed system in SSA; it is semi-structured and operates mainly at the individual or community level. In East Africa it constitutes 60–80% of total seeds

used, especially for indigenous vegetables, pulses, vegetatively propagated crops, oil crops, and cereals such as millet and sorghum. Seeds within this system are generally more easily accessible and cheaper as the major source is from farmer saved seed, but are of inconsistent quality.

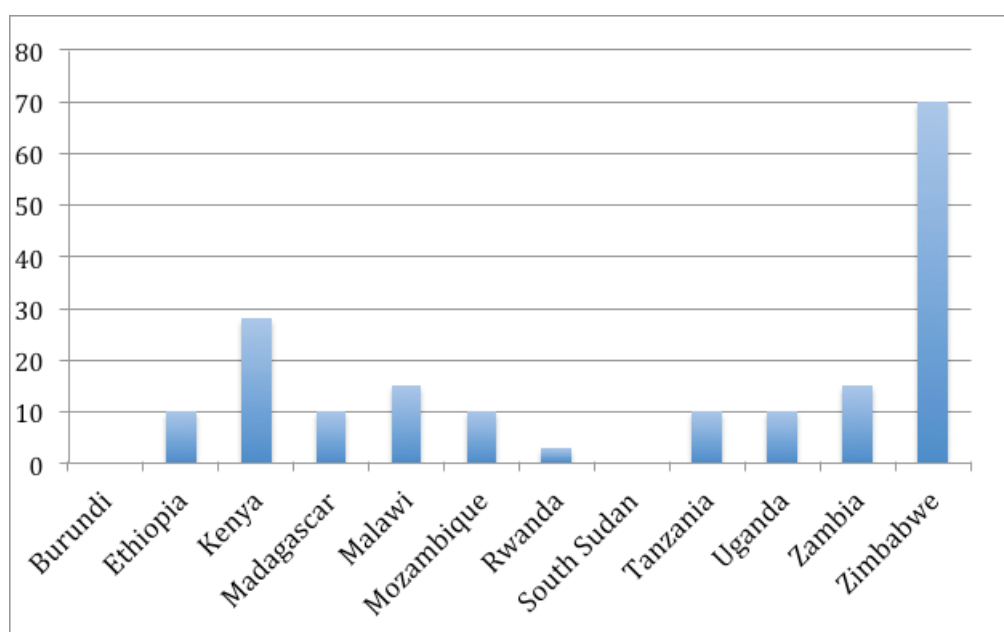
Integrated Seed Sector Development (ISSD)

A more recent development has been the emergence of the Integrated Seed Sector Development (ISSD) conceptual framework, which has 'evolved as a response to the almost exclusive focus on formal seed systems in seed sector development programmes'. While ISSD does recognise a 'plurality of seed systems' on the continent, its overarching goal is to draw potential seed business entrepreneurs into a more formal setting through policy interventions (Louwaars & De Boef, 2011).

The formal seed system

The formal seed system can be characterised as being deliberately constructed, with formal regulations to maintain varietal identity and purity, and physical, physiological and sanitary

Figure 1: Certified/formal seed as share of total seed use in select SSA countries (%)



Source: Access to Seeds Foundation, 2014. NB: No data available from Burundi or South Sudan.

quality; seed is marketed through officially recognised outlets (either public or private); there is a clear distinction between what is 'seed' and what is 'grain'; it can be characterised as being a linear chain; with significant seed flow to and from the informal sector. In SSA, for historical reasons, South Africa is the only country with a fully developed formal seed sector.

Seed breeding

Plant breeding in SSA faces unique challenges, including an almost total reliance on rain fed agriculture and a vast divergence in agro-ecological systems. Further, farming systems are predominantly small-scale in nature, with farmers growing a wide-range of crops to mitigate climatic and marketing risks (Lynam, 2011).

Prior to the independence of many countries south of the Sahara, the lion's share of formal crop research in SSA was channelled to the benefit of larger scale farmers of European descent, particularly maize, and to commodity export crops. From the late 1970s the Consultative Group on International Agricultural Research (CGIAR), a key player in the Asian Green Revolution, established a number of centres in SSA (Dano, 2007).¹

Donor funding for agricultural research peaked in the mid-1980s before declining as the donor community shifted toward other priorities. Faced by this evolving funding landscape, the CGIAR system underwent a substantial overhaul at the turn of the 21st century, which saw the organisation's 15 centres merged into one operational entity to oversee 15 global research programmes and the creation of a CGIAR Fund, to be housed at the World Bank in Washington D.C (ACB, 2015a).

Since 2006 the Bill and Melinda Gates Foundation (BMGF) has become a key actor in the agricultural research space in SSA. In addition to establishing the Alliance for a Green Revolution in Africa (AGRA), which has funded 66 PhDs in crop breeding the release

of 464 crop varieties in SSA, the BMGF has also become one of the CGIAR's biggest donors, having given the organisation approximately US\$ 720 million from 2003 to 2014. The BMGF also sits on the CGIAR Fund Council (ACB, 2015a).

In this evolving research landscape more emphasis is now being placed on the role of the private sector. For example, the CGIAR, still a major research body in SSA, has entered into a number of public-private-partnerships (PPPs) with multinational seed companies including Monsanto, DuPont Pioneer and Syngenta (See table 1, below). The Water Efficient Maize for Africa (WEMA) project, which brings together Monsanto, the International Maize and Wheat Improvement Centre (CIMMYT) and the National Agricultural Research Systems (NARS) of Kenya, Mozambique, South Africa, Tanzania and Uganda, is one such PPP. The bulk of WEMA's funding comes from the BMGF, which has extended some US\$ 85 million to the project so far. Civil Society Organisations have expressed a number concerns with the WEMA project, from the nature of germplasm sharing agreements to the efficacy of the transgenic aspects of the project (ACB, 2015a).

Despite this renewed interest, private sector breeding capacity in SSA (outside South Africa) remains limited. A recent World Bank report named just five African seed companies with the capacity to develop new types of germplasm: Zamseed and the Maize Research Institute (MRI) of Zambia, Pannar Seed of South Africa, Zimbabwe's Seed Co Limited and Kenya's National Seed Research Institute (World Bank, 2012). However, Pannar was taken over by DuPont Pioneer in 2012, MRI was acquired by Syngenta in 2013, and a significant share of Seed Co was bought by the French seed company, Vilmorin & Cie, in 2014. Given that Kenya's National Seed Research Institute is a public entity, this leaves Zamseed, itself the result of the privatisation of Zambia's national seed company, as the only indigenous seed company with significant research capacity.

1. The International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria (1967); the West Africa Rice Development Association (WARDA), now known as the Africa Rice Center, in Cotonou, Benin (1970); the International Center for Agricultural Research in the Dry Areas (ICARDA) (1970); the International Council for Research in Agroforestry (ICRAF) (1978).

Table 1: PPPs between the CGIAR and private seed companies in SSA

Project/purpose	Company	Other partners	Donor
Nitrogen use efficiency in maize (conventional hybrid, marker-assisted selection (MAS), GM)	DuPont-Pioneer	CIMMYT, KARI, SA Agricultural Research Council	BMGF, USAID (US\$ 19.5 million)
Maize and hybrid vegetable seed production	Syngenta	IITA	
Herbicide coated seeds to combat Striga weed	BASF	CIMMYT, Weizmann Institute of Science (Israel), AATF	USAID (US\$ 3 million)
Maize lethal necrosis (MLN) tolerant hybrid maize	Limagrain, Seed Co	CIMMYT	
Vitamin enhanced orange sweet potato	Seed Co, Land O Lakes, Kamano Seed	Center for International Forestry (CIFOR), IITA, International Potato Center (CIP)	

Sources: CIAT, 2014; CIMMYT, 2012, 2014; Harvest Plus, 2014; FeedtheFuture, 2015.

Intellectual property rights over seeds

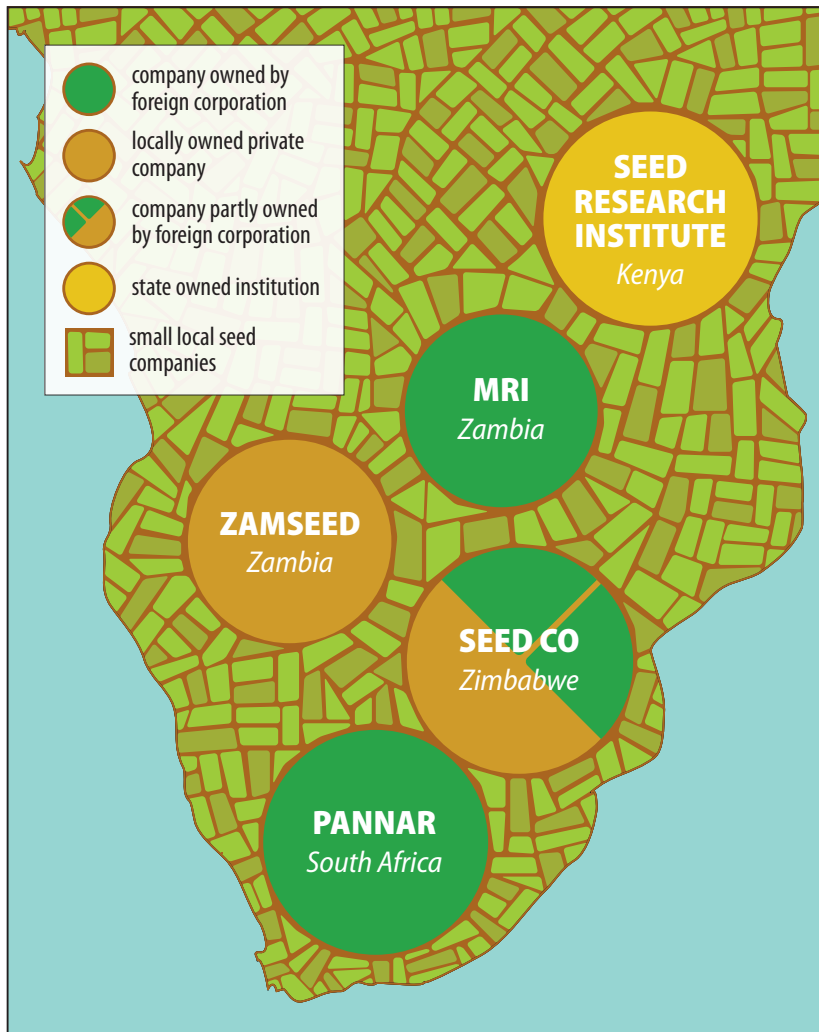
The implementation of strong intellectual property rights (IPRs) in agriculture on the continent is a key feature of the Green Revolution push, as it is assumed this is the only incentive that will draw in private sector breeders (World Bank, 2015). The Union for the Protection of New Varieties of Plants (UPOV), established in Europe in 1961, is the predominant model for intellectual property (IP) regimes in plant breeding (Kloppenber, 2014). UPOV's latest version, UPOV 1991, is the most rigid in terms of protecting IP holders over those of farmers, and is the one currently being foisted on countries in SSA. The majority of countries that are part of the G8 New Alliance on Food Security and Nutrition (G8 NAFSN) have pledged to amend their seed laws in line with UPOV 1991, while a number of initiatives in SSA are underway to harmonise PVP laws at the regional level (see Box below).

The rise in importance of IPRs in agriculture has happened in parallel with the growing influence of the private sector, and an increasing concentration of economic and IP resources among the world's largest seed companies. This has led many to question, even in fully industrialised economies, whether there is any link between strong IP laws and innovation (across all sectors of the economy) (Stiglitz; 2006, p.103-133). The issue of IP and seed is even more controversial in SSA,

where the recycling and exchange of seed are common practices.

With the promise of foreign direct investment (FDI) before them, it is perhaps expected that many governments in SSA have been amenable towards the UPOV 1991 model. However, a number of countries, including India, Malaysia and Ethiopia, have established PVP laws based on sui generis systems that are far more amenable to the needs of small-scale farmers than anything found in UPOV (Correa et al, 2015). There is also a burgeoning 'open-source' germplasm movement, inspired by the open-source movement in computer software. In this system researchers would have unrestricted access to an underlying base of germplasm, as long as any improvements would be made freely available for future research and use (ACB, 2015b).

Figure 2: African Seed companies with the capacity to develop original germplasm



PVP HARMONISATION INITIATIVES IN SUB-SAHARAN AFRICA

The African Regional Intellectual Property Organisation (ARIPO) and the Arusha PVP Protocol

The African Regional Intellectual Property Organisation (ARIPO), established in 1976, is the regional counterpart of the UN’s World Intellectual Property Organisation (WIPO) for 19

countries² in Anglophone Africa. In November 2009 proposals were approved within ARIPO to develop harmonised procedures for registering plant breeder’s rights (PBRs) for all ARIPO members, where a centralised PBR Office (PBRO) would be granted the authority to grant PBRs that would be recognised and enforceable in every ARIPO member state that ratifies the Protocol. A draft PVP protocol was formulated at the ARIPO conference in 2014 and was submitted to UPOV for examination of its conformity with UPOV 1991. UPOV concluded that, provided the protocol was adopted with no changes, ARIPO and its member states would be free to join UPOV (AFSA/GRAIN, 2015).

2. Botswana, Gambia, Ghana, Kenya, Lesotho, Malawi, Mozambique, Namibia, Sierra Leone, Liberia, Rwanda, São Tomé and Príncipe, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

In July 2015, at the ARIPO diplomatic conference held in Arusha, Tanzania, a slightly revised version of the draft PVP Protocol was adopted. Member states now have the right to object to any PBR granted at ARIPO's PBRO and to issue compulsory licenses in the public interest. However, the protocol remains anchored in the paradigm of UPOV 1991, maintaining heavy IP protection for plant breeders and threatening the ability of farmers to save, exchange and sell farm saved seed and/or other propagating material of protected varieties. Throughout the process, while the participation of African Civil Society Organisations (CSOs) were severely restricted and at times intentionally excluded, the international and African seed industry has been well represented, as well as the United States Patent and Trademark Office (USPTO), WIPO, the European Community Plant Variety Office (CPVO) and the French National Seed and Seedling Association (GNIS) and the AFSTA (AFSA, 2015).

Other processes to harmonise national PVP laws in SSA, based on UPOV 1991, are under way through the Organisation Africaine pour la Propriété Intellectuelle (OAPI), the regional IP organisation of predominantly Francophone African countries, and the draft PVP protocol of the Southern African Development Community (SADC). In the case of the SADC PVP protocol, intense lobbying from civil society resulted in SADC incorporating provisions on 'disclosure of origin' (as a means to prevent bio-piracy) and improved 'farmers' rights,' which gives farmers some flexibility to re-use farm saved seed of protected varieties. These provisions render the SADC PVP protocol technically non-compliant with UPOV 1991. It is highly likely that the Arusha PVP Protocol will entice more ratifications, since four countries, namely, Ghana, Mozambique, Sao Tome and Principe, and the Gambia, have already signed the Arusha PVP Protocol and there has already been one ratification (Liberia).

Seed production and certification

Once a new crop variety has been developed and registered, sufficient quantities of seed must be produced for commercial sale. Beginning with breeder seed, progressively larger quantities of seed are multiplied into pre-basic seed, basic seed and then certified seed. In order to be certified (legally permitted for sale) these varieties then have to pass through a number of field trials to ensure they are 'distinct, uniform and stable (DUS) (ACB, 2015b).

Seed production, including adherence to the DUS requirements, is highly technical, requires access to land and water, and is also highly regulated. Vegetable seed production is particularly onerous, with some seed requiring vernalisation to stimulate flowering.³ For this reason, even small-scale farmers with the requisite skills may be prevented from undertaking this on a commercial scale.

In most of SSA the early stages are carried out by public breeders and other government agencies such as the Association of Seed Multiplication Action Group (ASSMAG) in Malawi, or the Agricultural Seed Agency (ASA) in Tanzania. Lack of private sector involvement in seed production (see table 2 as an example) has been identified as 'a major bottleneck' in the seed value chains in SSA, and efforts are currently underway in a number of countries, such as Ghana, Tanzania and Uganda to liberalise and privatise seed production. The BMGF and USAID have been particularly active on this, having published a study on 'early generation seed' production early in 2015 (see Box below).

3. Vernalisation refers to the promotion of flowering by exposure of young plants to cold temperatures. It is effective on seeds that have taken in water or on a growing plant, but not on dry seeds. In the case of onions for example, vernalisation requires the seed to be kept below 10C for 2 months.

Table 2: Private sector involvement in seed production

Country	Use of certified maize seed (%)	Private sector production of foundation seed (%)	Private sector production of certified seed (%)	Imported Seed as % of total certified seed
Burkina Faso	50	0	100	NA
Ethiopia	18	5	N/A	1
Ghana	19	0	7	7
Kenya	70	0	15	15
Mozambique	6	13	15	15
Nigeria	7	0	54	15
Rwanda	12	0	N/A	NA
Tanzania	27	N/A	56	56
Zambia	65	100	1	1

Source: World Bank, 2014.

BILL AND MELINDA GATES FOUNDATION AND USAID SECRET MEETING ON EARLY GENERATION SEED (EGS) STUDY

In March 2015 two of the leading organisations behind the Green Revolution push in Africa, the BMGF and USAID, convened a meeting in London to discuss what they termed ‘bottlenecks’ in the seed sector. Discussions were led by a Deloitte-Monitor study on ‘Early Generation Seed’ (Monitor Deloitte, 2015), commissioned by the BMGF and USAID. The study aimed to develop models for the commercialisation of seed production in SSA, based on case studies from Ethiopia, Ghana, Nigeria, Tanzania and Zambia on maize, rice, sorghum, cowpeas, common beans, cassava and sweet potatoes. Participants at the meeting included other donor organisations—the Department for International Development (DfID), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and the World Bank; members of the CGIAR (CIAT, CIP); the UN FAO and the private sector (Syngenta, Uganda’s NASECO and Seed Co of Zimbabwe) (Lion et al, 2015). Conspicuously absent was any

representation by farmer associations, CSOs or community seed producers.

The Early Generation Seed study came in for criticism from many of the external experts who were asked for comment. These included arguments that the study excluded the informal sector, which remains the dominant sector on the continent; that many of the ‘ideal states’ presented were top-down and not demand-driven; and that more recognition should have been given to the role of the NARs in crop breeding. Some also commented that promotion of the private sector was not necessarily ‘the best approach’ in some situations (Lion, 2015).

Seed quality is a genuine concern for all farmers; small-scale farmers will be particularly hard-hit if the seed they plant fails to germinate or is diseased. Farmers who choose to purchase pre-packaged seed should also be confident that the product is genuine. The issue to be addressed is—as with approaches to PVP laws—that the proposed solution to a perceived lack of quality seed in SSA has been to implement certification schemes based on those from OECD countries, where agricultural conditions and practices are markedly different from those in SSA.

By definition, the DUS requirements will narrow the focus of seed production and

research. Given the sheer diversity of farming systems in SSA and the onset of climate change, the DUS test appears to be inappropriate. Numerous studies have found examples of community-based seed enterprises supplying good quality, uncertified seed to small-holder farmers (Van Mele et al, 2011), while even the World Bank has questioned the wisdom of harmonised certification laws in SSA (Keyser, 2013).

In semi-formal seed systems farmers and community-based organisations multiply and sell small quantities of improved varieties to other farmers within a restricted zone, with less onerous quality controls. Quality Declared Seed (QDS) is one such system, developed by the United Nations Food and Agriculture Organisation (UN FAO) in 1994, which is used in a number of countries in SSA including Uganda, Tanzania and Zimbabwe (CABI, 2014). In Tanzania the QDS system is currently restricted to the ward level; that is, QDS seed cannot be legally traded beyond the ward in which it has been produced. The expansion of this system beyond the ward level has been prioritised by some agricultural constituents in Tanzania, though this has been met with resistance from the private seed industry and some policy makers.

COMMON MARKET OF EASTERN AND SOUTHERN AFRICA (COMESA) SEED TRADE HARMONISATION REGULATIONS

These regulations were formulated with the help of the African Seed Trade Association (AFSTA) and approved by the Council of Ministers of the Common Market of Eastern and Southern Africa (COMESA) in September 2013. Their overarching goal is to facilitate trade in certified seed within the economic bloc's 20 member states,⁴ via the harmonisation of seed certification standards, phyto-sanitary rules and the establishment of a regional variety catalogue. Only varieties that conform to the DUS requirements will be listed in the Variety Release Catalogue and only certified seed will be sanctioned for regional trade, meaning that the cross border trade in farmers' and local varieties (which cannot conform to DUS) will be illegal.

Similar initiatives are underway in both the Economic Community of West African States (ECOWAS) and the SADC. Concerns by the seed industry over the slow pace of implementation of the ECOWAS seed regulation, adopted in 2008, led to the creation of the USAID-funded West Africa Seed Project (WASP), a five-year initiative being implemented by the West and Central African Council for Agricultural Research and Development (WECARD) (AFSA/ GRAIN, 2015).

At the time of writing, 12 varieties were listed on the SADC seed catalogue: 7 varieties of hybrid maize by Syngenta and a further 5 varieties of hybrid maize by Monsanto.⁵ Though the catalogue has only been operational for one year, it serves as an example of how

4. Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, South Sudan, Swaziland, Uganda, Zambia and Zimbabwe.
5. See: <http://sadcseedcentre.org/index.php/catalog>; (accessed 28/07/2015).

these catalogues are likely to look in future; dominated by the largest seed companies with a focus on a narrow range of commercially lucrative crops. Moving forward it will be important for farmer organisations and CSOs to monitor these catalogues to see if these trends continue.

Seed marketing

Seed marketing in a formalised system can be direct from seed producer to farmer, or via a chain of actors including distributors, merchants and agro-dealers (ACB, 2012). For some countries in SSA, such as Ethiopia, seed marketing remains by-and-large the preserve of government, with limited involvement from either the private or non-profit sectors. Elsewhere, a wider range of players, from multinational seed companies to large global NGOs such as World Vision and Catholic Relief Services, participate in seed marketing.

Proponents of the Green Revolution argue that agro-dealer networks remain the most suitable channels by which to market seed. Consequently this has become the focus of AGRA, which claims to have trained over 15 000 rural agro-dealers under its PASS programme (AGRA, 2014). The International Fertiliser Development Centre (IFDC), another major actor in this area, is currently undertaking projects on agro-dealer networks in 13 countries⁶ in SSA (IFDC, 2015). Inputs subsidy programmes (ISPs), which have undergone something of a revival in SSA over the last decade, are also a major distribution channel, particularly for hybrid maize.

It is important to note that different crop types are more amenable to distribution via agro-dealers than others. Vegetatively reproduced crops, such as potatoes, cassava and bananas, with their bulky and perishable

planting material, present challenges in terms of storage, transportation and management. Similar obstacles do not exist for the lighter, more portable seed of cereals and legumes. Consequently, the private sector rarely involves itself in the production or marketing of cereals and legumes (Van Mele *et al*, 2011).

THE ROLE OF THE PRIVATE SECTOR IN AFRICAN SEED SYSTEMS

At present the formal seed systems described above account for a small minority of the overall seed supply to farmers in SSA, though formal or certified seed adoption is higher in some crops and countries than others. The total value of the seed market in SSA is estimated to be worth around US\$ 800 million,⁷ less than 2% of the global total. Maize is the single biggest market, thought to be around US\$ 500 million,⁸ followed by horticulture at US\$ 250 million (AGROW, 2015). Some background is given below to the history of the maize seed industry in SSA, particularly in the south and east of the continent where it is most prominent. This is followed by a focus on some of the key events in the development of the seed industry in SSA since the turn of the century, including the establishment of the African Seed Trade Association (AFSTA), AGRA and the emergence of other agricultural 'modernisation' initiatives such as the G8 NAFSN and Grow Africa. This is followed by an overview of some of the key players, themes and trends currently taking place in the seed industry in SSA. More detailed information on some of the major seed companies operating on the continent can be found in the annex at the end of the paper.

6. Benin, Burkina Faso, Burundi, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Mali, Mozambique, Nigeria, South Sudan, Rwanda, Uganda.

7. This should be treated as an approximation: Industry reports state a figure of US\$ 1.2 billion for Africa as a whole. Subtracting figures for Egypt (US\$ 140 million), Morocco (US\$ 140 million), Algeria (US\$ 70 million), Tunisia (US\$ 45 million) and Libya (US\$ 25 million) leaves a figure just below US\$ 800 million.

8. Though these figures are given for the whole continent, it would be safe to assume that the US\$ 500 million for maize would predominantly apply to SSA.

Background to the private seed sector in southern and eastern Africa

The private seed industry in SSA is most well developed in the former settler economies of southern and eastern Africa, particularly in Kenya, Malawi, South Africa, Tanzania, Zambia and Zimbabwe, where colonial governments invested heavily in supporting farmers of European descent. From the late 19th century onwards maize replaced sorghum and millet as the dominant staple of southern Africa—it was higher yielding, easier to process and market (particularly to the British export market) and an easy way to pay workers on the large-scale farms and mines of South Africa, Rhodesia (Zambia and Zimbabwe) and Nyasaland (Malawi) (Smale & Mason, 2013).

Over the first half of the 20th century national hybrid maize breeding programmes were set up throughout the region, first in South Africa in 1925, followed by Kenya in 1930, Southern Rhodesia (today's Zimbabwe) in 1932, and Nyasaland (Malawi) in 1950. In 1958 breeders in Rhodesia successfully crossed two inbred parent lines to produce SR-52, the world's first commercially successful single-cross hybrid. South African private seed companies started their own hybrid maize breeding programmes, which were led by Sensako in 1959, followed by Sabi in 1960, Schoeman and Pannar in 1962 and the Northern Transvaal Co-operative in 1964. The early 1960s also saw the introduction of the first hybrid maize varieties in Kenya, produced by the Kenya Seed Company (KSC), which had been formed by commercial settler farmers in 1956 (Rusike, 1995).

By the 1980s virtually all the commercial maize crop in South Africa was planted to hybrid varieties and the industry had consolidated around six companies: Pannar, Sensako, Asgrow, Ciba-Geigy, Saffola and Cargill Hybrid Seeds.

In Zimbabwe the accession to power of the first democratically elected government in 1980 spurred the growth of the seed industry; smallholders rapidly adopted hybrids following the expansion of extension and infrastructure, and favourable producer prices. In response, South Africa's Pannar entered the Zimbabwean seed industry as PNR Enterprises in 1981, followed by Ciba-Geigy in 1982. Pioneer Hi-Bred established a maize hybrid programme in 1985, from which it introduced hybrids in the early 1990s (Rusike, 1995). Further to the north, in Zambia, a national seed company was founded in 1981 with financial support from the Swedish Development Cooperation Agency (SIDA) (Smale et al, 2013), while the first private seed company in Nigeria, AgSeed, opened for business in 1984 (Van Mele, 2011).

The onset of structural adjustment policies from the 1980s saw the further opening up of markets to multinational firms in the 1990s and the full or partial privatization of a number of national seed companies. Malawi's National Seed Company (MNSC) was among the first to go down this route with 55% of the company sold to Cargill Hybrid Seeds in 1989, who in turn sold their share to Monsanto in 1996. In 1999, as part of its cross-sectoral privatisation drive, the government of Zambia reduced its shareholding of the state privatisation fund from 40% to 37.5%, while its combined shareholding of the Zambia Co-operative Federation Limited and the Zambia Seed Producers Association (Zamseed) was reduced from 40% to 10%. As a result, Svalöf Weibull AB's⁹ shareholding increased from 10% to 27.5% while Swedfund¹⁰ International AB's shareholding increased from 10% to 25% (Sutton & Langmead, 2013). Despite a highly controversial privatization attempt in 2001, the Kenyan Government remains the major shareholder in the Kenya Seed Company (KSC) (Andae, 2014).

9. Svalöf Weibull AB is a subsidiary of the Swedish Farmers Supply and Crop Marketing Association (Lantmännen ekonomisk förening). It was formed in 1992 by the merger of two of Sweden's biggest seed companies, Svalöf and Weibull.

10. Swedfund is the Swedish government's venture capital fund for emerging markets.

Table 3: Number of private seed companies engaged in the maize seed industry in Africa, 1992

Region	Public	Private national	Multi-national	Co-operative	NGO	Total
East Africa	5	2	2	2	0	11
Southern Africa	4	5	9	2	0	20
West Africa	55	8	3	32	14	112
Total	64	15	14	36	14	143

Source: Rusike, 1995.

The new wave of seed industry investments in sub-Saharan Africa

Several developments since the turn of the century have contributed to the growing influence of the private sector in the seed systems of SSA. In 2000 the African Seed Trade Association (AFSTA) was formed, with support from the American Seed Trade Association (ASTA) and South African Seed Trade Organisation (SANSOR) to 'champion the interests of private seed companies in Africa'.

Another key event was the establishment of the Alliance for a Green Revolution in Africa (AGRA) in 2006, which claims to have given support to 80 seed companies in SSA since the initiation of its PASS programme in 2007 (AGRA, 2015). AGRA's seed company grants have been spread across 16 countries, most of which are

part of the Guinea-Savannah agro-ecological zone, a vast area deemed to have high agronomic potential. In Tanzania and Ghana, two AGRA 'breadbasket' countries, AGRA grants have gone to 11 and 10 companies respectively.

In Mozambique and Mali, AGRA's other two 'breadbasket' countries, only two companies in each country have received support, which is a reflection of the nascent state of the seed industry in both countries. In West Africa AGRA's interventions have been particularly noticeable. In Ghana, for example, 9 of 12 members of the recently formed Seed Trade Association of Ghana (STAG) have received AGRA grants (Joy Business, 2015). According to its PASS progress report, if production from all 80 PASS-supported seed companies were combined, this would constitute the largest seed producer working in SSA (AGRA, 2014).

Table 4: AGRA grants to seed companies by country, 2007–2012

Country	Number of companies receiving grants	Total grants (US\$)	Country	Number of companies receiving grants	Total grants (US\$)
Tanzania	11	2 001 577	Rwanda	3	471 837
Ghana	10	1 477 602	Kenya	2	313 000
Ethiopia	6	1 011 094	Burkina Faso	2	280 972
Nigeria	5	770 016	Mali	2	275 624
Zambia	4	735 141	Niger	2	262 475
Mozambique	4	698 495	South Sudan	1	152 300
Uganda	4	670 782	Sierra Leone	2	150 000
Malawi	4	601 523	Liberia	2	148 650
			Total	64	10 021 088

Source: AGRA, Grants Database.

Two other major external initiatives with direct links to private seed company expansion in SSA are Grow Africa and the G8 NAFSN, launched in 2011 and 2012 respectively. Grow Africa is a public-private investment initiative of the African Union Commission (AUC), the World Economic Forum (WEF) and the New Economic Partnership for Africa's Development (NEPAD).¹¹ Under Grow Africa private companies across the agricultural value chain, including DuPont Pioneer, Monsanto and Syngenta, have signed 'letters of intent' to expand their operations in Grow Africa countries.

Grow Africa was instrumental in the formation of the G8 NAFSN, officially launched at the G8 Summit hosted by the United States of America (USA) in May 2012. Like Grow Africa, the G8 NAFSN has been billed as an initiative to encourage FDI into agriculture in SSA, with G8 NAFSN countries¹² committing to policy and legal changes to facilitate this. Though ostensibly separate initiatives, all G8 NAFSN members are also part of Grow Africa,¹³ and the G8 NAFSN has been gradually moving closer to Grow Africa, the latter's direct connection with the AU giving it a veneer of legitimacy lacking in the G8 NAFSN.

Merging of donor interests: a new phase in private seed industry in SSA?

Throughout this period AGRA has remained a key player in seed industry development in SSA. As it approaches its tenth anniversary, AGRA appears to be undergoing a transition itself, moving away from broader support for all aspects of seed value chain development to more explicit focus on the established private sector. This can be seen in its work with USAID on the Scaling Seeds and Technologies Partnership (SSTP) and its new partnership with the BMGF (still its biggest sponsor) and the AFSTA.

In 2013 AGRA and USAID announced the launch of the SSTP, a US\$ 47 million, four-

year programme, that aims to increase the use of improved seed, fertilisers and other farming techniques and technologies in six African countries: Ethiopia, Ghana, Malawi, Mozambique, Senegal and Tanzania. These are all G8 New Alliance countries and USAID, providing the funding under its 'Feed the Future' initiative, is a major backer of the G8 NAFSN (ACB, 2015b).

Some of the specific goals of the SSTP include: attract between US\$ 40 million and US\$ 50 million in additional investments, to improve private sector seed production at the national level; spur the development of 12 seed technology or supply enterprises led by women; commercialise at least 50 technologies for improving farm production; reduce the average distance between rural farmers and agro-dealers from 20 to 6 kilometres; achieve a 45% increase in the use of improved seed, fertilisers, and other production technologies; increase grain production by 4.5 million tons; and boost food security for 7.6 million people (ACB, 2015b).

As has been the case under the G8 NAFSN (through, for example, its closeness to the Grow Africa platform), the SSTP will be looking to align its work with national agricultural investment programmes in each country; these programmes have been drawn up as part of the Comprehensive African Agricultural Development Programme (CAADP).

SSTP will continue AGRA's focus on food crops, though the focus will be on marketing varieties that have already been produced rather than any new research. One of the major goals for SSTP is to stimulate private sector involvement in the seed production process. Ideally this would be carried out by seed companies AGRA has already supported, but there is recognition that many emerging seed companies lack the capacities for seed breeding and production, indicating there may be more involvement in the process from larger regional and

11. In 2015 the Grow Africa Secretariat moved from its base at the WEF in Geneva to the headquarters of NEPAD in Midrand (between Johannesburg and Pretoria).

12. Benin, Burkina Faso, Cote D'Ivoire, Ethiopia, Ghana, Malawi, Mozambique, Nigeria, Senegal, Tanzania.

13. Kenya and Rwanda are the two other Grow Africa countries

international companies.¹⁴ There are clear parallels here with the WEMA project, where the AATF, Monsanto and CIMMYT have had to engage in seed production due to the absence of internal capacity among WEMA's African partner seed companies (ACB, 2015a).

Since its formation in 2000, AFSTA has become highly influential in lobbying for the seed industry in SSA (see box below). At the AFSTA annual congress in 2015 in Zimbabwe, a new partnership was announced between AGRA and AFTSA, whereby AGRA's principle donor, the BMGF, will make annual investments of around US\$ 100 000 in national seed trade associations throughout SSA, to be managed jointly by AGRA and AFSTA. According to a presentation given by Walter de Boef of the BMGF, the Foundation will provide support directly to national seed trade associations in Burkina Faso, Mali, Ghana, Nigeria, Ethiopia, Tanzania, Uganda, and AFSTA itself, while the SSTP (funded by USAID) will support seed trade associations in Malawi, Mozambique and Senegal (three countries in which the SSTP is currently working) (De Boef, 2015).

THE AFRICAN SEED TRADE ASSOCIATION (AFSTA)

AFSTA was formed in 2000 "to champion the interests of private seed companies" in Africa. SANSOR, the American Seed Trade Association (ASTA), the US Department of Agriculture (USDA), the NSCM Malawi, and the Ministry of Agriculture and Irrigation of Malawi were instrumental in establishing AFSTA, with support from ASTA and USDA who funded a preparatory meeting in Lilongwe, Malawi, in April 1999 (Seed Today, 1999).

AFSTA's members include the national seed trade associations of Benin, Burkina Faso, Burundi, Congo, Egypt, Ethiopia, Ghana, Kenya,

Madagascar, Mali, Malawi, Mauritius, Morocco, Niger, Nigeria, Tunisia, Senegal, South Africa, South Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

AFSTA is formally recognised by the African Union as the apex private sector seed organisation for Africa and has formal agreements with both COMESA and ECOWAS, with whom it is executing public-private partnerships. The Association has diplomatic status in its host country (Kenya), and observer status with the International Seed Testing Association (ISTA), UPOV, ASTA and the Asia-Pacific Seed Association (APSA). AFSTA is also a Board member of the International Seed Federation (ISF) and has strong relationships with the Groupement National Interprofessionnel Semences et Plants (GNIS) (France), Plantum (Netherlands), APSA (Asia) and ASTA (USA) (Heartland Global, 2013).

AFSTA is based in Kenya, although in 2007 USAID gave a grant to AFSTA to set up a West Africa regional office in Bamako, Mali, to house the coordinator of USAID's WASA. AFSTA's flagship projects are the Alliance for the Seed Industry in Eastern and Southern Africa (ASIESA); biotechnology outreach and awareness; the Eastern Africa Seed Committee (EASCOM); seed harmonisation in COMESA; and the AFSTA annual congress (AFSTA, 2015).

Groundwork for the establishment of ASIESA began in 2010 with funding from USAID. ASIESA is led by AFSTA, on behalf of and in partnership with COMESA (with further support from the Alliance for Commodity Trade in Eastern and Southern Africa (ACTESA), and operates under the mandate of an MOU with AFSTA-COMESA. Further work was conducted in 2011 by the AFSTA secretariat, with funding from USAID and support from the SFSA, who organised national seed industry association dialogues in Ethiopia, Kenya, Madagascar, Malawi, Tanzania, Uganda, Zambia and Zimbabwe. Angola, Botswana, the DRC, Mozambique, Namibia and Sudan have been identified as ASIESA's future target countries, after an initial five-year period (AFSTA, 2012).

14. Dr. Richard Jones, Chief of Party, Scaling Seeds and Technologies Partnership (SSTP), interview. 05/03/2015.

ASIESA's key strategic objectives are to strengthen the role and influence of the seed industry at national and regional levels, improve the competitiveness of seed companies and other value chain enterprises in eastern and southern Africa; support the COMESA seed trade harmonisation process, and increase farmer demand for improved varieties of seed. ASIESA partnerships will last from June 2012 to December 2016, at an estimated programme cost of US\$ 10.86 million. In July 2012 a further US\$ 3 million in in-kind contributions were secured from the private sector (AFSTA, 2012).

The transition in Africa's seed systems

Since the establishment of AGRA in 2006 the commercial seed industry in SSA has been undergoing a dramatic transition, one that is likely to continue for the foreseeable future. Generally, there has been a dramatic increase in the number of local registered seed companies across the continent, many of which have received support from AGRA.

A smaller group of these companies, many with the backing of new investment funds, are starting to expand their operations into neighbouring countries. The largest multinational seed companies are also expanding their operations on the continent, through both internal expansion and acquisitions. These companies have also been joined by another group of seed companies, predominantly from Asia and Europe, who are also banking on expanding markets for certified seed. Maize and horticulture, already the two biggest markets for certified seed in SSA, feature heavily in this new wave of investments.

The rise of seed company investment funds and the need for other sources of finance, such as micro-credit or input subsidies for small-scale farmers, illustrate the direction of the seed sector in SSA if support is not forthcoming for alternative seed systems.

A growing number of seed companies

It is clear that, on paper at least, there has been a marked increase in the amount of private seed companies operating across the continent. Whereas 29 private companies were found to be engaged in the maize seed industry across SSA in 1992, a survey for The Access to Seeds in Africa Index (TASAI) conducted in 2015 found 61 'active seed companies' in the maize sector in Kenya, South Africa, Uganda and Zimbabwe alone. Figures from the World Bank and AGRA gave a combined number of 332 seed companies in 9 African countries¹⁵ in 2012 (see Table 5).

It should however be pointed out that these statistics tell us precious little about the activities or capacities of these companies and, for all the talk, particularly from AGRA, to create a flourishing private seed industry on the continent it needs to be remembered that just 5 indigenous seed companies in SSA have significant breeding capacity. TASAI, for their part, admit from their research that 'most registered companies are either seed merchants or currently inactive'.

Mergers, acquisitions and expansion

Among the major global seed corporations DuPont Pioneer, Syngenta and Vilmorin & Cie have all strengthened their positions in SSA through the acquisition of local seed companies. The largest of these occurred in 2013, when DuPont Pioneer completed its takeover of South Africa's Pannar Seed, the largest African seed company on the continent at the time (see Box, p.21). Also in 2013, Syngenta purchased the largest seed company in Zambia, MRI for US\$ 84 million. MRI's white maize germplasm, built up through years of research, is considered 'among Africa's most comprehensive and diverse' (Syngenta, 2014).

French seed company Vilmorin & Cie, the world's fourth largest by market share, has also significantly expanded its operations on the continent by acquiring South African company Link Seed in 2012, and then raising its equity stake in Zimbabwe's Seed Co to 30% in 2014. At the same time, Seed Co sold 49% of its holdings

15. Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, Tanzania, Uganda, Zambia.

Table 4: Private seed companies in select SSA countries, 2002 - 2012

Country	Number of private seed companies		
	2002	2007	2012
Ethiopia	0	8	13
Ghana	-	-	10
Kenya	31	60	104
Malawi	2	5	11
Nigeria	-	-	32
Rwanda	0	1	5
Tanzania	-	-	66
Uganda	-	-	23
Zambia	-	-	16
Total			332

Source: AGRA, 2013; World Bank.

in local cottonseed company, Quton, to Mahyco of India. Emboldened by this significant injection of capital, Seed Co has taken steps to strengthen its position within Zimbabwe through the acquisition of vegetable seed company, Prime Seeds, in June 2015 (*Zimbabwe Herald*, 2015).

For political reasons, Zimbabwe has not been part of any of the high profile Green Revolution projects such as AGRA or the G8 NAFSN, though due to the historical development of its own private seed industry and the recent stabilisation of the economy its seed sector is in the midst of a wave of consolidation. In a recent report, the Agricultural Marketing Authority (AMA) of Zimbabwe has warned that this consolidation in the Zimbabwean seed industry had increased farmer dependency on expensive external inputs and threatened to shift public and private research towards a narrow range of profitable crops. Zimbabwe's 'multi-currency' position has also meant that seed-production costs were now cheaper in neighbouring countries, with detrimental impacts on local seed production (Kuwaza, 2015).

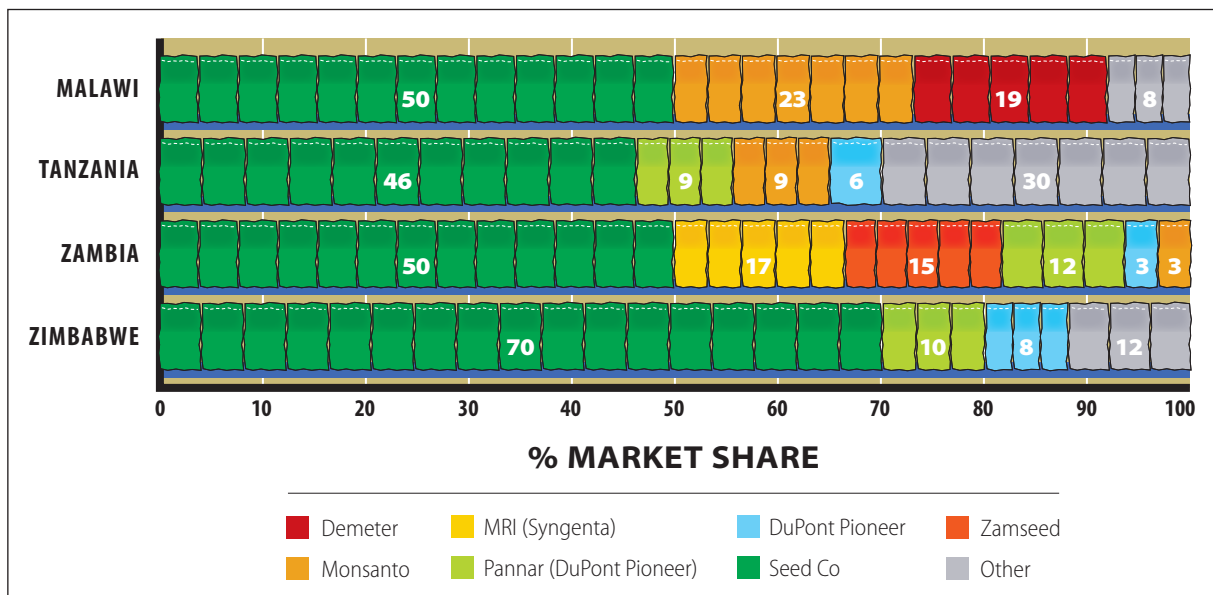
In South Africa the financial firm PSG Consult, via its agribusiness subsidiary Zeder, acquired two of the larger remaining independent seed companies, Agricol in 2012 and Klein Karoo in 2013 (Klein Karoo, n.d.). Klein Karoo has subsidiaries in Zambia, Zimbabwe and Mozambique, while Agricol is currently

establishing branches in Zambia, Rwanda, Zimbabwe, Mozambique, Angola, Kenya and Tanzania (African Business Journal, n.d.).

Seed companies of varying sizes are also expanding their own operations throughout the continent. Monsanto, already well established in certain markets through previous acquisitions, has expanded its maize seed plant in South Africa's North West province and in January 2015 moved its SSA headquarters to Kenya to be closer to high growth markets. DuPont has made significant investments in infrastructure in its African operations in recent years, opening new research centres in Kenya and South Africa in 2009, and new seed conditioning facilities in Zambia in 2009 and Ethiopia in 2011. In June 2015 DuPont opened a new seed warehouse in Zambia to increase maize seed storage capacity for Zambia and potential export markets in Kenya and Tanzania (Pucci, 2015). Syngenta's take-over of Zambia's MRI in 2013 was followed up with huge investments in its first African R&D facility in South Africa in 2014, with planned investments in seed-treatment facilities in Kenya in 2016 and Nigeria in 2019 (Mokhema & Khanyile, 2014). This all forms part of its plans to invest up to US\$ 500 million on the continent in order to create a US\$ 1 billion business by 2022.

Of the African seed companies Seed Co has the largest geographical footprint, with a presence in 15 countries and research centres

Figure 3: Market share data by country, 2011



Source: Renaissance Capital, 2011.

in 7. It also enjoys a large market share in a number of countries (see figure 3). According to its 2015 annual report, 61% of Seed Co's total revenue of US\$ 95 million came from outside of Zimbabwe. Further expansion plans are afoot in both the Great Lakes region (Burundi, Rwanda and the eastern DRC), and West Africa. In Nigeria, Seed Co has ambitions to control 60% of the hybrid maize seed market of the country and earn overall revenue of US\$ 28 million by 2020 (Seed Co, 2015).

The Great Lakes region is an area of interest for numerous Africa seed companies, including Tansed of Tanzania, KSC and East Africa Seed Company from Kenya, and Uganda's Victoria Seed, NASECO and FICA (Access to Seed Foundation, 2014). Zamseed recently signed a five-year Memorandum of Understanding (MOU) with the Botswana Agricultural Marketing Board (BAMB), for Zamseed to provide BAMB with seed. The company plans to open a subsidiary operation in Botswana within the next three years. Plans are also underway to sign an MOU with relevant government departments in Namibia this year (Ntakhwana, 2015).

Another sign of the ambitious plans of local seed companies is in the number of them that have signed up to the G8 NAFSN and Grow

Africa, more associated with the multinational seed companies. Seed Co subsidiaries in Malawi and Tanzania have both signed up, as has Tansed. Two Mozambican seed companies, Lozanne Farms and Dengo have also signed up. Interestingly, the latter three companies are also AGRA grantees (Dengo via the AGRA-funded African Fertiliser Agribusiness Partnership).

Beyond the global seed giants and local companies is a layer of less publicised international seed companies, many from Europe and Asia. Two of these companies, East-West Seed of the Philippines and Dutch-based Rijk Zwaan, have entered into a joint venture called Afrisem to produce tropical vegetable seed in Tanzania. In India, driven by potentially lucrative markets and a near saturation in the domestic cotton seed market, several hybrid seed companies are said to be looking at aggressively expanding into African markets, predominantly through buying local firms. Countries of interest in SSA currently are Kenya, Ethiopia, Mozambique, South Africa, Tanzania, Zambia, and Zimbabwe (Kesireddy, 2015). The purchase of 49% of Zimbabwean firm Quton Cotton by Mahyco, the Indian Bt cotton producer (in which Monsanto has a 26% holding) suggests that a new investment wave from India may just have begun (AFSA, 2014).

Table 5: Regional African seed companies in southern and eastern Africa

Company	Markets (home in bold)	Crop		Business Model		
		Field	Vegetables	R&D	Prod.	Marketing
East Africa SC	Kenya , Uganda, Tanzania, Rwanda, South Sudan					
FICA	Kenya, Tanzania, Uganda , Rwanda, South Sudan					
Hygrotech	Kenya, Malawi, Zambia, Zimbabwe, Tanzania					
MRI	Zambia , Tanzania, Mozambique					
NASECO	Uganda , Rwanda, South Sudan, Burundi					
Progene	Zimbabwe , Zambia					
Victoria	Uganda , Rwanda, Burundi, South Sudan					

Source: Access to Seeds Foundation, 2014.

Another Indian seed company with a large footprint in SSA is Advanta Seed, part of UPL Limited (formerly United Phosphorous), an Indian multinational with interests in agro and industrial chemicals, fertiliser and seed (UPL, 2015). Advanta’s key crops in SSA are sorghum, sunflowers, maize, canola, forages, rice and vegetables, which it markets in 18 countries on the continent, and aims at further expansion into Botswana, Mozambique, Niger and Rwanda. Advanta is a world leader in the sorghum market, having a 26% global market share. Its sweet sorghum hybrid varieties are already market leaders in South Africa and Zambia, and it is targeting OPV to hybrid sorghum conversion in its markets in SSA (Advanta Seeds, 2014).

This expansionist drive is natural for any profit driven company, particularly one which anticipates lucrative market growth, but it also hints at the importance of regional markets for large seed companies on the continent, and hence the drive for regional harmonization of IP and seed trade laws. For seed coming from farmer-managed systems, regional trade will be illegal. It is questionable if even the smaller local companies will be in a position to do this, or will become mere agents for the largest companies operating on the continent. The fact that so far only Monsanto and Syngenta have

registered varieties on the SADC regional seed catalogue does little to dispel these concerns.

Further, what little information is available indicates a high degree of market concentration in certain crops, such as maize. Recent figures from The African Seed Index Figures (TASAI) show that the top three companies in Kenya control 93% of the maize seed market (the KSC alone accounts for 80%). The top four companies in Uganda and Zimbabwe control 77% and 86% respectively (TASAI, 2015). No company names are given, but given other information it is safe to assume who they are. Since 2010 multinational seed companies have taken either partial or complete control of three of SSA’s largest seed companies, Pannar Seed, Seed Co and MRI. The Green Revolution push in SSA, of which AGRA has played a vital role, has created a new rising class of African seed companies. If previous trends are to continue it will not be long before these companies too become the targets of acquisition of each other or the larger multinationals.

THE PIONEER-PANNAR MERGER

In late 2010 DuPont Pioneer and Pannar Seed, South Africa's largest remaining private seed company, applied to the Competition Commission of South Africa (CompCom SA) for approval of a merger between the two companies. Citing concerns that the deal would reduce the South African maize seed market to just two competitors and concomitant anxieties over the potential impacts on seed pricing, the Commission prohibited the merger in December 2010.

This decision was appealed by DuPont and Pannar, with three weeks of hearings at the Competition Tribunal taking place in September 2011. The Tribunal heard many hours of testimony from a variety of global seed industry experts, scientists and economists. In particular, an expert appearing on behalf of the ACB testified that the 10% seed price increase which would result from the merger (a figure determined by CompCom SA) would have a 'devastating' effect on the 1.2 million small-scale commercial and subsistence farmers in South Africa. The Tribunal upheld the Competition Commission's decision to prohibit the merger; but again, DuPont and Pannar appealed the decision, this time to the Competition Appeals Court (CAC). In May 2012 the CAC approved DuPont's acquisition of Pannar Seed.

After the merger, which was finalised in August 2013, Pannar has operated as a business unit within DuPont Africa's regional structure (Pannar Seed, n.d.). An immediate result of the merger has been the significant strengthening of DuPont Pioneer's position in the South African commercial seed market, where the combined entity now accounts for 25% of registered varieties in the top 6 horticultural crops and fully 51% of varieties for the top 6 agronomic crops (DAFF, 2014). DuPont Pioneer has also released three GM maize 'events' onto the South African market since it first approached the Competition Commission to merge with Pannar, and has conducted field trials for a further 9 GM maize events and 4

GM soya events since the beginning of 2014 (DAFF, n.d.).

It has also acquired Pannar's strong positions in Zimbabwe, Zambia and Tanzania, where, going on 2011 figures, the new combined entity controls 18%, 15% and 15% of the markets respectively. Pannar was also the third largest seed company in Kenya, in terms of market share, during the 2012/13 season (Vilmorin, 2013).

Narrow focus on maize and vegetables

While it would be unfair to say there has been an exclusive focus on maize and vegetables from the private sector, there is no doubt that these two markets are being disproportionately targeted, particularly by the larger companies.

Given its importance as a staple crop in much of the continent, a long history of publically funded research and the politicization of maize seed via a resurgence in ISPs, it is hardly surprising that maize features prominently in the transformation currently underway in SSA's seed systems. Replacing OPVs of maize with hybrid varieties is clearly the long term goal, as witnessed by the focus on hybrid varieties in many PPPs involving the CGIAR centres, the provision of hybrid varieties through ISPs and the expanded operations of the major seed companies. Though hybrid varieties often have higher yield potential, this is usually contingent upon optimal growing conditions and the applications of complimentary inputs, such as pesticides and synthetic fertiliser.

In Malawi, for example, ACB fieldwork found that the hybrid maize varieties being planted by small-scale farmers were particularly susceptible to post-harvest weevil attack. In response to this many farmers were treating their stored maize grain, the majority if not all of which is for personal consumption, with insecticides (ACB, 2014). Hybrids also need to be purchased fresh every season in order to maintain optimum yield. In rural SSA for a variety of reasons, not least the cost, this is not feasible for the majority of farmers without entering into debt or selling other important

assets (animals, for example). Additionally, with rainfall patterns across the continent no longer predictable, optimal planting times are shifting, and a reliable supply of good quality OPVs will give farmers increased flexibility to deal with these climatic challenges (ACB, 2015a).

At the global level, maize is one of the world's largest traded agricultural commodities. It is also, along with soya and cotton, one of the three major crops grown world-wide that is genetically modified (some 57 million ha in 2013). Looking ahead, the spread of hybrid maize across the continent is a necessary pre-condition for the introduction of genetically modified (GM) maize varieties. There are a number of field trials of GM maize varieties underway in several countries in SSA, coupled with an intense lobbying effort by the seed industry for the acceptance of GM crops in SSA.

Seed production for trade is another highly lucrative avenue. In Zambia, which has a smaller internal market than most of its neighbours, the seed industry has been investing to take advantage of its position as the continent's leading exporter of certified seed (World Bank, 2012). In addition to a long history of hybrid maize breeding, Zambia holds some 40% of the water resources of the southern African region (PMRC, 2015), irrigation being a vital component of certified seed production. Subsequent to Syngenta's acquisition of MRI in 2013, in June 2015 DuPont opened a new seed warehouse in Zambia to increase maize seed storage capacity for Zambia and potential export markets in Kenya and Tanzania (Pucci, 2015). Again, the benefits of a strict regional trade harmonisation to the private seed industry are obvious to see.

Another major area of seed industry activity is horticulture, which has been overshadowed in the Green Revolution narrative by a focus on grain crops. Horticulture in SSA has also been associated in the past with Kenya's highly lucrative export trade in vegetables and cut flowers to the European Union (EU). As described above, there are also specific challenges that severely limit local seed production. In Kenya, for example, bulb onions have been grown for more than 70 years, but all onion seed is imported.

Under its G8 NAFSN commitments, Monsanto, who acquired global vegetable seed companies Seminis and De Ruiter in 2005 and 2008 respectively, has plans to expand improved vegetable seed adoption in Tanzania, while Syngenta plans to do the same in Ethiopia, Kenya and Tanzania. The Syngenta Foundation for Sustainable Agriculture (SFSA) has also been working on vegetable seed in Kenya and certified potato seed, in conjunction with Dutch company HZPC (the world's largest private potato seed company), in Kenya and Tanzania.

Another multinational vegetable seed company, East-West Seed of the Philippines, has entered into a joint venture, 'Afrisem', with Dutch seed company Rijk Zwaan to produce tropical vegetable seed in Tanzania. This venture has subsequently gained additional support from the Dutch Ministry of Foreign Affairs and Wageningen University. African seed companies have also started to look into vegetable seed, including Seed Co and Tanseed. Vilmorin & Cie, who now control 30% of Seed Co, is the world's second largest vegetable seed company in terms of market share. In June 2015 Seed Co acquired the Zimbabwean vegetable seed company Prime Seeds, further indicating its plans for expansion in horticulture.

Other large horticultural seed companies present in SSA include Pop Vriend, a Dutch vegetable seed company that has maintained a presence in Tanzania since the late 1950s (Pop Vriend, n.d.), and the Japanese company, Sakata Seed, which bought South Africa's Mayford Seeds in 1999 and now has a market presence in Lesotho, Swaziland, Botswana, Namibia, Zimbabwe, Zambia, Madagascar and Mauritius (Sakata Seed, n.d.). The Amiran Seed Company sells vegetable seed as part of a package including fertiliser, irrigation and greenhouse equipment. The company is based in Kenya but is part of the UK-based Balton CP group. It sells vegetable seed throughout eastern and western Africa and much of the latter trade is via its local agent, Dizengoff, a major fertiliser importer in West Africa (Balton CP, n.d.).

Though grain crops have garnered most of the attention regarding the Green Revolution push in Africa, developments in the horticulture sector merit further attention from progressive

agricultural and farmer organisations. AGRA too has been working on a vegetable seed policy with the World Vegetable Centre (AVRDC, 2014), indicating that the issue is only going to become more important.

Further investments

Many of the seed companies that have received grants from AGRA's PASS programme have received further funding from a number of investment vehicles that have materialised in recent years. This is clearly an indication that the seed companies deemed to have the best potential returns on investment are already starting to emerge as larger players in SSA.

In West Africa, the six companies which AGRA considers the 'leading companies', Nafaso (Burkina Faso), M&B Seeds (Ghana), Faso Kaba (Mali), Enterprise Alheri (Niger), Manoma Seeds and Maslaha Seeds (Nigeria) (AGRA, 2013) have all received grants from AGRA, plus additional investments from Injaro Agricultural Capital Holdings.

Injaro is a US\$ 49 million investment fund focused on small and medium sized enterprises along the agricultural value chain in West Africa. Major contributors to the fund include DfID (US\$ 15 million), the Dutch Development Bank (US\$ 10 million), the French Development Bank (US\$ 7 million) and a further US\$ 17 million in private capital from six investors, including AGRA, the Lundin Foundation and the Soros Economic Development Fund. Injaro's investments in the West African seed industry include: Nafaso SA (Burkina Faso), M&B Seeds (Ghana), Faso Kaba (Mali) and ES Alheri (Niger) (DfID, 2014). Individual investment amounts are undisclosed but a 'typical' investment by Injaro is between US\$ 300 000 and US\$ 3 million (Injaro capital Holdings, n.d.).

Also in West Africa, in 2013 Wienco Ghana, one of the largest agricultural input companies in the country, received a US\$ 20 million trade finance facility from the African Agriculture and Trade Investment Fund (AATIF) for use in procuring inputs to smallholder farmers in cocoa, maize and cotton (AATIF, 2013). The AATIF is a closed-end investment company initiated by the development bank of the German Federal Government. The fund, managed

by Deutsche Bank, had assets in excess of US\$ 141 million as of April 2015 (Deutsche Bank, 2015).

In 2009 the African Seed Investment Fund (ASIF) was launched in East Africa with a US\$ 12 million grant from AGRA, to invest in at least 20 small to medium size seed companies in eastern and southern Africa. ASIF is managed by Pearl Capital Partners, an agricultural investment management fund based in Kampala, Uganda, although domiciled in Mauritius. ASIF's investments are typically in the form of loans, and conversions into equity stakes in such companies are not uncommon (ACB, 2015a). It has already invested in a number of regional seed companies in the region (see Table 6).

Another, much larger, fund operating in eastern and southern Africa is AECF. The AECF is a US\$ 207 million fund that awards grants and loans to "stimulate private sector entrepreneurs in Africa" and operates in agriculture, agribusiness, renewable energy, adaptation to climate change, and access to information and financial services. Its major donors are DfID (US\$ 99 million), SIDA (US\$ 39 million), the Australian Department of Foreign Affairs and Trade (US\$ 32 million), the Royal Netherlands Embassy (US\$ 25 million) and DANIDA (US\$ 12 million). The board of AGRA has "ultimate fiduciary responsibility and accountability for AECF" (ACB, 2015a)

Other social investment funds to have invested in the African seed industry include the Voxtra East African Agribusiness Fund, whose investors include Norfund, private equity firms and private individuals in Scandinavia (Voxtra, n.d.) and the Acumen Fund, a US-based entity that invests charitable donations in profit-making ventures.

Other initiatives demonstrate a similar model of start-up investments. In Tanzania the Syngenta Foundation for Sustainable Agriculture (SFSA) provided technical support to Mtanga Farms Limited, who made their first sales of certified potato seed in 2012. SFSA also facilitated US\$ 1 million investments in Mtanga Farms from Voxtra and the AECF. In Kenya, building on a 2009–2011 project implemented by CIP and funded by USAID and GIZ, the

Table 6: Funding sources for emerging African seed companies

Company	Country	Grants / investments
Alemayehu Makonnen Farm PLC	Ethiopia	AGRA: US\$ 200 000 (2010–2013) ASIF: US\$ 1 000 000 (45%)
Century Seed	South Sudan	AGRA: US\$ 152 300 (2012–2014) AECF: US\$ 500 000 (2012)
Dryland Seed	Kenya	AGRA: US\$ 150 000 (2007–2010) ASIF: undisclosed AECF: US\$ 584 000
Enterprise Semenciere Alheri	Niger	AGRA: US\$ 140 000 (2009–2010) Injaro Investments: undisclosed (minimum US\$ 300 000)
Faso Kaba	Mali	AGRA: US\$ 208 500 (2007–2009) Injaro Investments: undisclosed (minimum US\$ 300 000)
Funwe Farm Ltd.	Malawi	AGRA: US\$ 138 073 (2007–2012) ASIF: undisclosed
Ledlet	Kenya	AGRA: US\$ 163 000 (2007–2009) AECF: 360,000 (2011)
M&B Seeds	Ghana	AGRA: US\$ 149 765 (2009–2012) Injaro Investments: undisclosed (minimum US\$ 300 000)
Seed Tech.	Malawi	AGRA: US\$ 150 000 (2007–2009)
Western Seed Company	Kenya	ASIF: US\$ 1.9 million Acumen Fund: US\$ 1.9 million Voxtra East African Agribusiness Fund: US\$ 1.4 million

Source: Acumen Fund, AECF, AGRA, ASIF, Injaro Investments, Voxtra.

SFSA facilitated a royalty agreement between Kenyan seed company Kisima Farm Limited with Dutch Breeder HZPC (the world's largest private potato seed company), whereby the former would sell HZPC varieties under license. This was followed by an additional investment of US\$ 700 000 from the SFSA and the African Enterprise Challenge Fund (AECF), and a US\$ 500 000 contribution from Kisima itself.

Table 6 above, though by no means definitive, gives an indication of the patterns of investment, where an initial AGRA grant has been followed with additional funding, sometimes from multiple sources. The monetary size of these follow-on investments gives an indication of the economies of scale being targeted. Kenya's Western Seed Company, said to be the country's largest private seed company, has received more than US\$ 5 million in three separate investments.

This need for extra financial resources is not confined to local companies. In June 2013 Groupe Limagrain (Vilmorin & Cie's parent company) entered into a long-term strategic partnership with French financial giant, the Crédit Agricole Group, involving an investment of EUR 70 million in order to strengthen Limagrain's business interests (Seed Quest, 2013). A substantial portion of this capital injection was spent in expanding Vilmorin's shareholding in Seed Co.

The crucial role of finance

Finance is equally as important at the other end of the seed value chain, as certified seed is currently too costly for the majority of small-scale farmers in SSA to purchase fresh every season. The majority of the rural population in SSA does not have access to any form of financial services and agriculture is seen as a particularly risky venture. A World Bank

report found that in ten African countries¹⁶ the average percentage of commercial bank lending to the agricultural sector was 7%. The cost of borrowing is also markedly higher for agriculture, with average real interest rates being above 15% in half of the countries observed (World Bank, 2014).

For this reason all the major Green Revolution actors are involved in some way in increasing the provision of agricultural finance. Grow Africa, which has a working group on finance that includes ABSA-Barclays,¹⁷ Kenya's Equity Bank and Rabobank of the Netherlands, estimates that up to US\$ 11 billion of investment is needed each year to 'achieve the aspired expansion of agricultural output in sub-Saharan Africa' (Grow Africa, 2014). In 2009 AGRA signed an agreement with Standard Bank of South Africa under which Standard Bank will offer US\$ 100 million in loans to smallholder farmers and small agricultural businesses (US\$ 25 million each to Tanzania, Mozambique, Ghana and Uganda) (AGRA, n.d.).

Lending is also being expanded to seed companies themselves, who often then extend this credit to their customers. In Nigeria, commercial bank lending to seed companies increased from N 1.8 billion in 2012 to over N 6 billion in 2014. In part this has been spurred by government funds through the Nigerian Incentive Based Risk Sharing System for Agricultural Lending (NIRSAL), which provides credit guarantees for seed companies to access financial lending from commercial banks in Nigeria (Emejor, n.d.).

Finance could be provided in a number of forms including asset-backed products (e.g. where a title deed to land is used as collateral), value chain financing (where a loan for agricultural inputs is paid back at the time of harvest), or a warehouse receipt system (where farmers can borrow against the value of produce they have deposited in a warehouse).

Access to affordable financial services has the potential to improve the material conditions of millions of smallholder farmers, but there are inherent risks involved as well as the potential to fundamentally alter social relations in rural SSA. The demarcation and titling of land is a key policy under the G8 NAFSN, both to create a market for land and to give people collateral to borrow against. However, this means that a climatic shock or low food prices could put millions of small-scale farmers at risk of landlessness. These risks apply also to value chain financing which tends to focus on cash crops. In Malawi tobacco farmers barely make ends meet from season to season, once their initial input loans have been deducted from their harvests (ACB, 2014). Fieldwork conducted by ACB in the Mvomero district in Tanzania found very few small-scale farmers engaged in sugar production, with many citing low prices as a deterrent (ACB, 2015b).

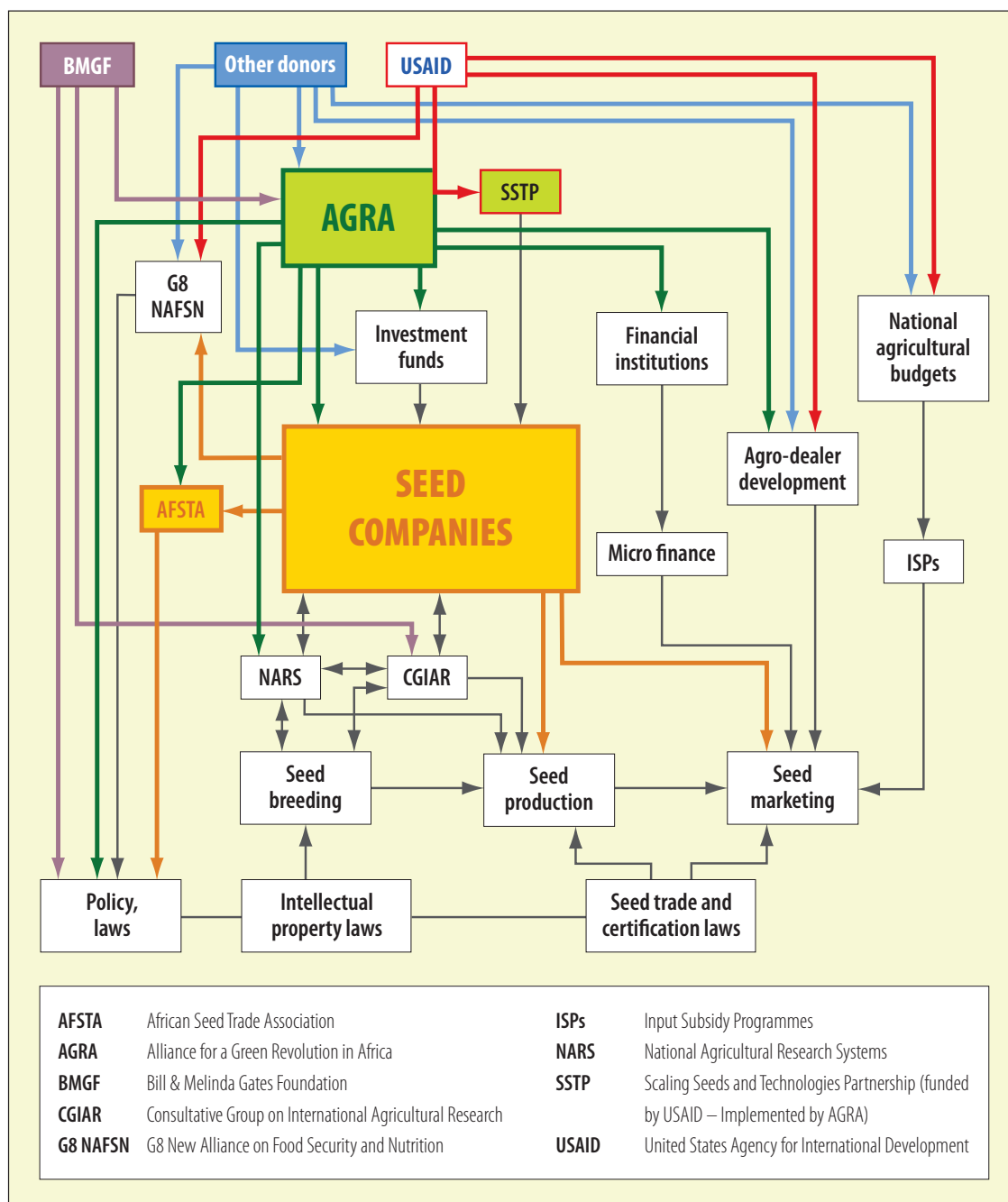
Warehouse receipt systems are only as good as the management capacity of the system. According to the World Bank, experience of these systems in Ethiopia, Ghana and Tanzania have been 'mixed' (World Bank, 2014). Further, the economies of scale required to run such systems could narrow the range of crops grown and eventually require more standardised produce.

Another major source of finance for purchases of certified seed production are the numerous ISPs, which have risen across the continent over the last decade or so. ISPs have particularly benefited the large local and multinational seed companies who produce and sell hybrid maize. In Malawi, often hailed as an ISP success story, Monsanto, Seed Co, Pannar (now owned by DuPont Pioneer) and Demeter Seed (part of the Farmer's World Group of Companies), have been major beneficiaries of the country's Farm Input Subsidy Programme (FISP) (ACB, 2014). Seed Co attributed an US \$ 11 million drop in revenue between 2014 and 2015 largely to the scaling back of ISPs in Malawi and Zimbabwe.

16. Burkina Faso, Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Tanzania, Zambia.

17. ABSA Group Limited is a South African financial institution that, since 2005, has been 51% owned by Britain's Barclays Bank.

Figure 4: Major actors in the formal seed system in SSA



The rise of ISPs has been subject to much comment and analysis in academic and agricultural policy-making circles, though, given the huge costs involved, much of this coverage has focused on fertiliser rather than seed subsidies. A recommendation from the Deloitte-Monitor study funded by the BMGF (see box, page 17) was to divert funding from fertiliser subsidies to the small-grains to increase their availability to small-scale

farmers. While this is arguably a better use of public resources than ISPs for maize and fertiliser, which largely supports the major seed and fertiliser companies, the same report also envisages the eventual entry of the private sector into the seed production and marketing of small-grains and other 'niche' varieties, so again there is a potential long-term implication of public resources being captured by the private sector.

SEED SECTOR COMMERCIALISATION IN SSA: WHAT ROLE FOR THE AVERAGE AFRICAN FARMER?

The transformation of Africa's seed systems from those that are predominantly farmer managed (with some input from the public sector) to those that are dominated by the private sector will impact upon the livelihoods of tens of millions of people across the continent, where commercial imperatives often do not complement existing socio-economic or climatic conditions. The optimum growing conditions that certified seed requires in order to fulfill its inherent potential, for a number of reasons, are simply unobtainable for all but a small-minority. This will become even more critical as the impacts of climate change further exacerbate challenges on the ground. Even initiatives such as Integrated Seed Sector Development (ISSD), that itself recognizes some of these challenges, is focused on the integration of commercially oriented production as an end point.

The harmonisation of IP, certification and trade laws is seen by many as a pre-requisite for further private investment in the seed industry. However, these harmonisation processes are likely to profoundly impact the practices of farmers on the ground by restricting the re-use and exchange of farmer and local varieties where these are mixed with protected varieties. Onerous certification laws will lock the majority of small-holder farmers out of the seed production process, as they will not have access to sufficient quantities of land or capital to carry this out. Seed production will increasingly be taken up by the private sector, which will prioritise the markets for commercially lucrative crops.

Shifting maize adoption away from OPVs to hybrids will also impact upon small-scale farmers in a number of ways. First, in order to achieve their yield potential hybrids usually require additional agro-chemical inputs, and there are often issues around post-harvest storage that are not so significant in OPVs

or local varieties. Hybrids also need to be purchased fresh every season in order to maintain optimum yield. In rural SSA for a variety of reasons, not least the cost, this is not feasible for the majority of farmers without entering into debt or selling other important assets (animals, for example). Additionally, with rainfall patterns across the continent no longer predictable, optimal planting times are shifting, and a reliable supply of good quality and diverse varieties of OPVs will give farmers increased flexibility to deal with these climatic challenges.

Horticulture is another area where heavy investments have been made by the seed industry, both by multinational firms and African seed companies. Interventions, particularly in east Africa, have highlighted the heavy technical and financial demands of commercial horticultural production, including access to certified seed and other inputs, irrigation and greenhouse equipment. Certified horticultural seed production is also very onerous, and only feasible for well-resourced farmers.

AGRA is playing a highly significant role in this transformation through support for fledgling seed companies on the continent. These initial investments have been broadly based, though AGRA itself has previously identified the need for future consolidation in farming operations to achieve economies of scale. AGRA has also actively supported a number of agricultural investment funds that have targeted some of the larger seed companies that have previously received AGRA funding. These investments are typically larger and in the form of loans or equity positions rather than grants, suggesting that these companies are likely to target more commercially orientated farmers and crops.

AGRA's role too appears to be modifying with the times, as it has now started to work more closely with both the G8 NAFFS (through the SSTP) and the AFSTA. The G8 NAFFS has made no attempt to hide its preference for large-scale commercial farming operations, while AFSTA is an influential lobbying body for the seed industry in Africa and has played a large part in the legal harmonisation drive underway, processes which have, so far, largely shut out small-scale farmer participation.

RESISTANCE AND ALTERNATIVES FROM THE GROUND

This wave of commercialisation of SSA's seed systems is being met with resistance at all levels, from the ground up to the policy level. The ACB made substantial inputs against DuPont Pioneer's proposed take-over of Pannar Seed in 2011. The Alliance for Food Sovereignty in Africa (AFSA), a continental alliance of farmer, farmer support organisations and CSOs, has vigorously lobbied against the harmonisation of national seed laws at the regional level, including the COMESA Seed Trade harmonisation regulations, ARIPO's Arusha PVP Protocol and the SADC Draft Protocol. At a workshop to review the latter, in Johannesburg in early 2014, AFSA members lobbied for the inclusion of important provisions on disclosure of origin and farmers rights, effectively rendering the Draft Protocol non-compliant with UPOV 1991 (AFSA, 2014b).

At the national level, small-scale farmer organisations and CSOs have been challenging against a proposed plant breeder's rights Bill in the Ghanaian parliament (La Via Campesina/ GRAIN, 2015), while in Uganda a consortium of civil society organisations filed a case in the Constitutional Court against the government to declare the Plant Variety Protection Act, 2014 null and void (Musoke, 2015). In West Africa a campaign led by rural women, We are the Solution, are campaigning for the promotion of the preservation of peasant seeds in Senegal,

Burkina Faso, Mali, Ghana and Guinea (Adler & Bell, 2015). Thousands of other organisations are doing similar work throughout SSA.

At the heart of this resistance is the recognition that farmers themselves should be intimately involved in the selection, improvement and production of seed, involvement that will be beyond the reach of the majority of farmers under the current Green Revolution paradigm. This does not require re-inventing the wheel; the public sector still plays a significant role in plant breeding and in some instances small-scale farmers are involved in the process to a certain degree. Likewise in seed production, alternatives to certification such as QDS and community seed production enterprises are already providing an important service, and could do even more given adequate support.

What is clearly needed in SSA are diversified programmes that cater for a wide range of location-specific 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 (ACB, 2015c). ACB field research throughout 2014 and 2015 has come across numerous farmers, farmer organisations and farmer support groups who have expressed interest in exploring the possibilities of these. Such systems would, in every sense of the word, be farmer managed.

CONCLUSION

It is clear that Africa's seed systems are in the midst of a profound transition, away from farmer managed seed systems where farmers and public researchers are the primary agents of breeding, selection, and distribution, towards systems that are led and shaped by the private sector. For a variety of reasons, including historical, political and climatic, this process of transition is at varying stages from country to country and crop to crop. The theory of change behind these transitions remains fairly consistent across SSA, however; low agricultural productivity and the need to feed an increasing African (and global) population in an era of climate change will require the adoption of improved or certified seed. The private sector is seen as the primary agent for achieving this.

This paper has focused on the private sector players in SSA's seed sector and it is worth noting that all these companies require an enabling environment in which to operate. This includes legal changes to protect private sector investment in research and marketing, access to finance so farmers can afford to purchase these new seed varieties (and the accompanying agro-chemicals) and stable output markets (with the underlying physical infrastructure) to ensure that farmers are able to re-pay their creditors. This has involved huge investments of time and money in agricultural practices and policies concerning research, registration and marketing.

These initiatives—those of AGRA, the G8 NAFSN and others—do not occur on a blank slate. There is a long history of attention to improved seed varieties in SSA, particularly regarding maize in the former settler economies of the east and south of the continent. Many of the national seed companies established to support settler farmers with improved varieties of fodder and maize are at various stages of privatisation, and are looking to expand their footprints into neighbouring countries—the Great Lakes region is an area of particular interest.

Large multinational seed companies have all established a presence of varying degrees in

SSA. Some of them, such as DuPont Pioneer, have been on the continent for many decades, while others, Limagrain for example, are more recent entrants. All these companies have consolidated their positions through the purchase of local seed companies: Monsanto bought South Africa's largest two seed companies, Carnia and Sensako, at the turn of the century; DuPont expanded its already extensive presence by buying South Africa's Pannar Seed in 2012; Syngenta bought the Zambian seed company MRI in 2013. These companies, and others, have joined the G8 NAFSN and 'committed' to expanding their businesses in certain countries, though in many cases (DuPont in Ethiopia, Monsanto in Tanzania and Malawi) these companies already had a strong position in these markets.

Aside from the former national and multinational giants, a number of regional seed companies based in Europe and Asia also operate on the continent, particularly in the horticultural sector. This is a sector with its own unique challenges for research, especially in seed production, but it has been largely overlooked. Much of the attention on seed issues in Africa, particularly since the establishment of AGRA, has been focused on improved cereal grains and the large companies that stand to benefit from an expansion in these markets.

The establishment of AGRA in 2006 has seen the emergence of a plethora of small and medium sized indigenous seed companies in the ensuing decade. According to AGRA it has supported more than 80 seed companies since its PASS programme was initiated, the combined seed production of which makes AGRA 'Africa's largest seed company'. However, increased market concentration over time is a feature of a privatised seed industry and there is evidence that this is happening even in commercial maize seed markets in SSA. A select few of the seed companies to which AGRA has given grants have also received further funds, often in the form of loans, from a variety of investment and venture capital firms that have started to look for opportunities in SSA. This suggests a diminishing number of larger seed companies over time. Given the nature of the investments being made in them, will the focus of these companies be restricted to seed crops

for which there is a commercial market, or will their interests extend beyond these?

More recent developments suggest the convergence of a number of critical Green Revolution actors involved with seed, including USAID's funding of AGRA to conduct its SSTP in six countries that are part of the G8 NAFSN,

or the BMGF's new programme to support (via AGRA) the AFSTA. Given the close ties between AFSTA and other global players in the seed industry, it appears that further dramatic changes in the SSA's seed systems and rural communities are in the offing.

Annex 1: MAJOR SEED PLAYERS IN SSA

DuPont Pioneer

Pioneer Hi-Bred was founded in 1926 as the Hi-Bred Corn Company, by future United States Secretary of Agriculture and Vice President, Henry A. Wallace. In the mid-1930s it became the first seed company in the world to produce and market hybrid maize varieties, and was the largest seed company in the world at the time of its takeover by DuPont, in 1999 (Kloppenburg, 2014).

In the intervening period DuPont Pioneer has been usurped as the global seed leader by Monsanto, but it maintains a significant global market share, estimated at 16%. In 2014 Pioneer's seed sales amounted to 22% of total agricultural sales (including crop protection) for the calendar year 2014 (DuPont, 2014).

Pioneer's activities in Africa go back more than half a century, to 1964 when it forged a strategic alliance with South Africa's Pannar Seed. In 1985, following political changes in the country, Pioneer started a hybrid maize-breeding programme in Zimbabwe (the fruits of which would be released in the early 1990s) and also established operations in Egypt. The early 1990s saw Pioneer's further expansion on the continent, into Ethiopia, South Africa, Tanzania and Zambia (Rusike, 1995). In the same period Pioneer made 'extensive investments' in West Africa, in Cameroon, Côte D'Ivoire and Nigeria, although these were 'written off' in 1993 (De Vries & Toenniessen, 2001). Operations have subsequently been established in Angola, Kenya and Malawi (DuPont Pioneer, n.d.).

DuPont has made significant investments in infrastructure in its African operations in recent years, opening new research centres in Kenya and South Africa in 2009, and new seed conditioning facilities in Zambia in 2009 and Ethiopia in 2011. In June 2015 DuPont opened a new seed warehouse in Zambia to increase maize seed storage capacity for Zambia and

potential export markets in Kenya and Tanzania (Pucci, 2015).

DuPont has achieved some gains in terms of market share in SSA, particularly in Ethiopia, where it is estimated to hold 25–30% of the (albeit small) hybrid maize market, and has established a foothold in other maize markets in the region, such as Malawi, Zambia and Zimbabwe (G8 NAFSN, 2014). While working to expand its customer base among small-scale farmers in these and other countries, DuPont's approach has been to include what could be termed non-profit 'service providers', including US-based Technoserve in Kenya and Tanzania, and Farm Input Promotions Africa Limited (FIPS) in Tanzania, Ethiopia and Malawi.

DuPont Pioneer's activities under the G8 NAFSN/Grow Africa platform have so far been restricted to Ethiopia and Ghana, where it is working through a local company called AgriServe. In Ethiopia DuPont Pioneer has launched a multi-partner Advanced Maize Seed Adoption Programme (AMSAP), which provides hybrid maize seed and on-farm training, while USAID has established demonstration plots and conducted agronomic and post-harvest training for more than 4 000 farmers and extension workers. As part of its strategy in Ethiopia the company has invested US\$ 2 million in a seed plant, which has increased hybrid seed production from 4 000 MT in 2013 to 8 000 MT in 2014 (G8 NAFSN, 2014). In Ghana DuPont's local agent, AgriServe, has registered hybrid maize seed varieties and has been promoting their use among smallholder farmers (Grow Africa, 2014).

In recent years DuPont's most significant activity on the continent was its acquisition in 2013 of Pannar Seed, the largest remaining independent seed company in South Africa. At the time the acquisition was described by the company as "one of the biggest transactions in DuPont's history and the biggest it has made in Africa" (Sherry, 2013). Pannar was founded in 1958 and was the first private seed company to introduce its own hybrid maize varieties into South Africa during the 1960s; it had previously forged a strategic alliance with Pioneer Hi-Bred, in 1968. In the late 1970s Pannar began a

significant expansion into SSA. The company website currently lists 24 countries¹⁸ in SSA where Pannar has a presence. Moreover, Pannar had initiated five agricultural research stations throughout southern Africa, developed research partnerships with the Kenyan Agricultural Research Institute (KARI), CIMMYT and the IITA (ACB, 2012), and established world-leading programmes for breeding white maize and sorghum.

Monsanto

At the dawn of the 20th century Monsanto emerged in the USA as a chemical manufacturer, but would not become a serious player in the US chemical market until the post-Second World War economic boom. In part this was due to its strong links with the US military-industrial complex (ACB, 2011). In 1975 Monsanto registered its glyphosate-based herbicide 'Roundup', which would become the world's bestselling herbicide and establish Monsanto as a major player in the global agro-chemical industry.

Developments in modern biotechnology, particularly its application to the production of glyphosate tolerant GM seed, drew Monsanto further into the seed market, primarily through acquisitions during the 1990s. Today Monsanto is the world's largest seed company. For the financial year ending August 2014, Monsanto's revenue topped US\$ 15.8 billion, with total profits exceeding US\$ 2.7 billion. Its research and development (R&D) expenses for the year were US\$ 1.7 billion (Monsanto, 2014).

Monsanto's major seed sector presence on the African continent is currently in South Africa, where it established itself in the late 1990s through the takeover of two major players in the market at the time, Carnia Seed and Sensako. Sensako had operated in the agrochemicals market in South Africa since 1968 (ACB, 2011) and is acknowledged as the major player in the South African seed industry, holding approximately 45% of the market for field crops (Vilmorin & Cie, 2013).

From 2006 to 2011 Monsanto established and then expanded its Lichtenburg maize seed plant in South Africa's North West province, which has primarily been aimed at supplying seed export markets in Africa and beyond.

Elsewhere Monsanto has focused its attention on eastern and southern Africa. In addition to South Africa, its locally registered companies in Kenya, Malawi, Zambia and Zimbabwe are all listed as members of AFSTA (AFSTA, 2015), and it has expansion plans for Tanzania and Ethiopia. In January 2015 the company moved its African headquarters from Johannesburg in South Africa to Nairobi in Kenya, to be closer to what it considers its future growth markets (Visser, 2015). In West Africa Monsanto's seed and crop protection business is based in Dakar, Senegal (Monsanto, n.d.), and it has also been an active participant on the steering committee of the USAID-sponsored West Africa Seed Alliance (WASA) (Schmida, 2011).

As yet Monsanto has failed to replicate in other markets on the continent the seed market dominance it enjoys in South Africa. In 2010/11 Monsanto had 6% to 9% (depending on the source of information) of the hybrid maize seed market in Tanzania, and 3% of the seed market in Zambia (Renaissance Capital, 2011). In Malawi, where Monsanto purchased the NSCM from Cargill in 1996, it has more of a foothold; the same source of information gave the company a 23% of the seed market in 2011 (although a more recently published source gave them only a 15% market share) (Access to Seeds Foundation, 2014). Monsanto, together with Seed Co, Pannar and Demeter, has been a major beneficiary of Malawi's FISP, which subsidises the use of hybrid maize seed and synthetic fertiliser and is the major factor behind Malawi's relatively high adoption rates for these inputs, compared with other countries in SSA (ACB, 2014).

Anticipating potentially large markets on the continent, Monsanto is one of a number of major seed multinationals involved in the

18. Angola, Botswana, Burundi, Cameroon, Chad, Congo Brazzaville, DRC, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Senegal, South Sudan, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

G8 NAFSN. Monsanto's commitments under the G8 are focused on Malawi, where it plans to release new hybrid maize varieties and GM Bt cotton, and Tanzania, where it has plans to 'strengthen maize and vegetable chains' in the Southern Agricultural Growth Corridor of Tanzania (SAGCOT). Its activities in Tanzania will include improving access to finance, making 3–5 new maize hybrid varieties available 'royalty free' and strengthening agro-dealer networks (G8 NAFSN, 2014a).

Syngenta

Syngenta arose from the merger of Novartis and Zeneca at the height of major seed industry restructuring in the 1990s. Its primary business interests are in pesticides, though it still maintains a significant presence in many global seed markets. In 2014 Syngenta group sales totalled US\$ 15.1 billion, with crop protection accounting for US\$ 11.4 billion and seed sales a further US\$ 3.2 billion. In its seed segment, maize (US\$ 1.1 billion), soya (US\$ 525 million), sunflowers, oilseed rape and sugar-beet (US\$ 644 million combined) and vegetables are its most valuable products (Syngenta, 2014).

Syngenta's areas of focus are currently in the south and east of the continent. Its East Africa business, which covers Kenya, Tanzania, Ethiopia, Uganda, Eritrea, Somalia, Djibouti, Rwanda and Burundi, is managed from Nairobi. The company also has representatives in Tanzania and Ethiopia.

From 2001 to 2006 Syngenta embarked upon a joint venture with Zimbabwe's Seed Co, the objective being to gain a foothold in the southern African market. This venture was abandoned because, in the words of Syngenta's head of Africa-Middle East business, "there was no direct fit at that moment between our (Syngenta's) germplasm as well as the Seed Co Zimbabwe germplasm" (Competition Appeal Court, 2012).

In 2012, coinciding with the launch of the G8 NAFSN, Syngenta announced that it had major plans for expansion in Africa, with planned investments of US\$ 500 million to create a US\$ 1 billion business by 2022. Many of these planned investments fall under the G8 NAFSN

and the Grow Africa Platform—Syngenta is a member of the Grow Africa working group on Finance. Between the two initiatives Syngenta has committed to work in Cote d'Ivoire, Ethiopia, Kenya, Mozambique, Nigeria, Rwanda and Tanzania.

In Cote d'Ivoire and Tanzania the company is involved in rice value chain projects, while in Ethiopia, Kenya and Tanzania, it aims to expand commercial horticultural production. This includes a partnership with USAID in Kenya to establish seven horticulture centres of excellence to train farmers on production and market access. At the policy level Syngenta has been heavily involved in the USAID-funded West Africa Seed Programme (WASP) (CORAF/WECARD, 2014).

In the intervening period Syngenta has taken several steps to cement its position on the continent. In July 2013 it acquired the Zambian seed company MRI for US\$ 84 million. MRI was the largest completely private seed company in Zambia, established by leading maize breeders previously employed by the government (Smale et al, 2013), and its white maize germplasm is considered 'among Africa's most comprehensive and diverse' (Syngenta, 2014). Syngenta followed this by opening its first R&D facility in Africa, at Brits, South Africa, in May 2014. In November that year a fully automated herbicide formulation and packaging facility was opened on the same site, the first of its kind in Africa (Syngenta, n.d). The agribusiness giant plans to open a second African seed-treatment facility in Kenya in 2016, with further expansion plans in West Africa, 'probably Nigeria', mooted for 2019 (Mokhema & Khanyile, 2014).

Projects initiated by the Syngenta Foundation for Sustainable Agriculture (SFSA) in Africa include collaboration with AfricaRice in Burkina Faso, Mali and Senegal; working with smallholders in Kenya to establish seedling nurseries and greenhouses for vegetable production; and a project with the University of Bern to breed 'dwarf' varieties of tef (*Eragrostis tef*) in Ethiopia. The Foundation has also established a major project to increase small-scale farmer access to improved seed through three areas of intervention: policy; linking public breeders with small and medium

sized private companies; and building markets for improved seed through the provision of various financial instruments (e.g. credit, crop insurance, market linkage etc.) (SFSA, n.d.).

Following a successful pilot phase in Kenya and Tanzania, the Seeds2B project will be scaled up, together with the AATF, to include Côte d'Ivoire, Mali, Rwanda and Senegal. Future expansion is expected in due course, planned for fourteen countries in SSA.¹⁹ Crops to be addressed by the programme include sorghum, millet, rice, cassava, potatoes, sesame, sunflowers, groundnuts and vegetables (AATF, 2014).

Policy interventions under Seed2B include: involvement in WASP to introduce a harmonised variety release system throughout ECOWAS; advising the government of Rwanda on the development of a national seed policy; and facilitating seed certification training in Tanzania (SFSA, 2015).

Substantial progress has been made on potato seed in Kenya and Tanzania. In Kenya, building on a 2009–2011 project implemented by CIP and funded by USAID and GIZ, the SFSA facilitated a royalty agreement between Kenyan seed company Kisima Farm Limited with Dutch Breeder HZPC (the world's largest private potato seed company), whereby the former would sell HZPC varieties under license. This was followed by an additional investment of US\$ 700 000 from the SFSA and the African Enterprise Challenge Fund (AECF), and a US\$ 500 000 contribution from Kisima itself. In Tanzania the SFSA provided technical support to Mtanga Farms Limited, who made their first sales of certified potato seed in 2012. SFSA also facilitated US\$ 1 million investments in Mtanga Farms from Voxtra, a Norwegian social investment vehicle, and the AECF.

Following these ventures the SFSA aims to implement similar models for the development of soybean value chains in East Africa, with the potential involvement of DuPont Pioneer, Seed

Co and Link Seed (the latter two being partly or wholly owned by Limagrain) (USAID, 2014).

Vilmorin & Cie

French-based Vilmorin was established in 1743, making it the world's earliest known seed company (De Bruins, 2009). Today it is fourth largest seed company overall; maintains the number one position in the European wheat seed market; is the world's second largest vegetable seed company; and is the third and fourth largest company in the North American and European maize seed markets respectively.

Vilmorin's major shareholder (73.7%) is Groupe Limagrain, a French agricultural co-operative founded in 1941. In addition to its controlling interest in Vilmorin, Group Limagrain also has significant interests in wheat processing and baking value chains in the European Union. A significant minority-shareholder in Group Limagrain is the Banque Publique d'Investissement, a state-owned investment bank established in 2012 by the French government to support small and medium sized enterprises (Vilmorin & Cie, 2014). In June 2013 Limagrain entered into a long-term strategic partnership with French financial giant, the Crédit Agricole Group, involving an investment of EUR 70 million in order to strengthen Limagrain's business interests, including its seed subsidiary Vilmorin (Seedquest, 2013).

Vilmorin's first foray into Africa came in 2013, when it purchased South African seed company Link Seed, for EUR 10 million (Vilmorin & Cie, 2013). In the same year Vilmorin also acquired a 15% stake in Zimbabwe's Seed Co, a share which has subsequently risen to 30%. To consolidate its position in the southern Africa region, Vilmorin plans to build a breeding station in South Africa and expand Seed Co's activities in maize, wheat, barley, soya, sorghum, cowpeas, groundnuts, sunflowers and rice. It also plans to expand its horticulture activities, so far

19. Malawi, Ethiopia, Ghana, Nigeria, Cameroon, Benin, Liberia, Guinea, Chad, Madagascar, Burkina Faso, Mozambique, Zimbabwe and Uganda.

restricted to Kenya, South Africa and North Africa, into southern Africa.²⁰

Seed Co

Seed Co's roots can be traced back to the formation of the Rhodesia Seed Maize Association (RSMA) in 1940. In 1958, based on work done by public breeders, RSMA became the first company in the world to produce and market a single-cross hybrid maize variety—SR52. In 1980 the RSMA changed its name to the Zimbabwe Seed Maize Association, to reflect the new political dispensation in the country, and in 1996 the association became Seed Co and was floated on the Zimbabwe stock exchange.

According to its latest annual report, Seed Co, which has a presence in 15 countries in SSA,²¹ is the market leader in maize and wheat in Zimbabwe and Malawi, maize and soybean in Zambia and Tanzania, and ranks number two in the Kenyan maize and soybean market. Other industry figures, from 2012/13, give Seed Co a 70% market share in Zimbabwe, and 50% in Malawi and Zambia. It currently has seven research centres throughout SSA: three in Zimbabwe, two in Zambia (which opened in 2003 and 2009 respectively), one in Kenya (2004) and one in Nigeria (2014) (Seed Co, 2015).

In 2015 Seed Co's group revenue was US\$ 95 million, down from US\$ 106 million in 2014. A major reason for this drop in revenue has been attributed to the scaling back of ISPs in Malawi and Zimbabwe, which caused turnover to drop in these markets by 7% and 12% respectively. That said, after-tax-profits increased compared with the previous year, from US\$ 11.8 million in 2014 to US\$ 15 million in 2015. The majority of Seed Co's revenue (61%) and profits (69%) are now generated outside Zimbabwe, reflecting its more than US\$ 25 million in investments beyond Zimbabwe since 2011 (The Herald, 2015), and in 2014 the company's R&D budget was

US\$ 5.2 million (Seed Co, 2015). By any measure it is a large company and it could be argued that, after Pannar's takeover by DuPont Pioneer, Seed Co is Africa's largest remaining seed company.

Consequently it was of great significance when French Seed giant Vilmorin took a 15% equity stake in Seed Co in 2013, and then doubled this to a 30% share in 2014. However, Vilmorin is not the only major overseas shareholder; Seed Co's 2015 Annual Report reveals that other leading shareholders include Stanbic Bank (part of South Africa's Standard Bank Group) with a 14.6% share, and Old Mutual Zimbabwe, which, although London-listed, is part of another South African financial giant, the Old Mutual Group, which owns 12.3% of Seed Co (Seed Co, 2015).

In recent years Seed Co has expanded beyond its traditional base in southern and eastern Africa. Ethiopia is seen as a potentially large market although progress has been hampered by difficulties with securing a business license. The company has also been exploring a potential acquisition in Uganda but admits that this is still 'very far' from being concluded (Mwanawashe, 2015). In late 2012 Seed Co entered the Rwandan market in a joint venture with the country's largest brewer to develop commercial maize for beer production. In 2013 Seed Co was officially registered in Rwanda and assisted its government in commissioning a new seed processing plant. The company has subsequently been granted management of the plant with a view to securing a long-term leasing agreement. Seed Co sees its Rwandan operation as a beachhead for potentially huge markets in the Great Lakes region, including Burundi, Uganda and north and south Kivu in the eastern DRC; a region with a population of 60 million people (Seed Co, 2015).

West Africa is seen as another key growth area for Seed Co; the company has so far made a capital outlay of some US\$ 5 million

20. Michel Debrand, CEO, Limagrains-Africa. Interview. 05/03/2015.

21. Angola, Botswana, Ghana, Zimbabwe, Zambia, Malawi, South Africa, Mozambique, Tanzania, Kenya, Ethiopia, Rwanda, Nigeria,

in Nigeria and Ghana (Sunday Mail, 2014). Seed Co's Nigerian entity visualises itself as "the dominant and distinct maize producer and pace-setter" in the country. It projects sales revenue of US\$ 28 million by 2020, with US\$ 4.1 million in after tax profits, and control of 60% of the hybrid maize seed market. In order to achieve this, Seed Co has entered into a joint venture (70/30) with a local crop protection company, SARO AgroSciences. SARO is said to control 30% of the Nigerian market. Together the two companies will establish a local seed company, have already established a research centre in Nigeria, and have licensed two products from local researchers. The first proprietary product was released in June 2014 (Mwanawashe, 2015).

Kenya Seed Company (KSC)

KSC was established in 1956 in Kitale to produce pasture seed for colonial settlers. Its first pasture varieties were released in 1956, followed by the first maize hybrids in 1962. Since then the company has developed over 60 seed varieties of maize, wheat, pasture, sunflower and horticulture. KSC is the dominant player in the Kenyan maize seed market and accounts for up to 90% of hybrid maize seed market, according to some estimates (World Bank, 2013).

In addition to its strong position in Kenya, KSC owns three subsidiaries in east Africa, all incorporated in 2002: Simlaw Seeds, which specialises in vegetable seed and operates in Kenya, Uganda and Tanzania; Mt Elgon Seed Company Limited in Uganda, and Kibo Seed in Tanzania. KSC is also venturing into Rwanda, the DRC and South Sudan (Kenya Seed Company, n.d).

Unlike the national seed companies of neighbouring countries in southern and eastern Africa, KSC has yet to be fully privatised, though this is a contentious issue for the company. In 2001 the board of KSC issued nine million new shares, equivalent to 12.5% of the company, which were sold to KSC management at the time. This effectively privatised the firm as it reduced the Kenyan government's shareholding in the parastatal to 40%. However, the transaction has not been recognised by the Kenyan government,

leading to over a decade of turmoil at KSC—the company's entire board and management were dismissed in 2003.

In December 2013 former managing director of KSC, Nathaniel Tim, obtained a court order to hold an extraordinary general meeting in order to restrict the government's voting rights to reflect accurately its 40% shareholding. However, the Kenyan state, through Agricultural Development Kenya, challenged the decision and tried to bar the participation of former KSC executives. It argued that any such meeting would result only in the "confirmation of an illegality, namely the privatisation of a government parastatal" (Andae, 2014).

Zamseed

The Zambian national seed company (Zamseed) was established in 1981 with financial support from SIDA (Smale et al, 2013). In 1999, as part of its cross-sectoral privatisation drive, the government of Zambia reduced its shareholding from 40% to 37.5% under the state privatisation fund. At the same time, the combined shareholding of the Zambia Co-operative Federation Limited and the Zambian Seed Producers Association (ZSPA) was reduced from 40% to 10%. As a result, Svalöf Weibull's shareholding increased from 10% to 27.5% while Swedfund International AB's shareholding increased from 10% to 25%. Currently, Zamseed's management holds a majority share in the firm (Sutton & Langmead, 2013).

Zamseed recently signed a five-year Memorandum of Understanding (MOU) with the Botswana Agricultural Marketing Board (BAMB), for Zamseed to provide BAMB with seed. The company plans to open a subsidiary operation in Botswana within the next three years. Plans are also afoot to sign an MOU with relevant government departments in Namibia this year (Ntakhwana, 2015).

Tanseed

The Tanzania Seed Company was established in the early 1970s by the government of Tanzania as part of its formal seed sector development and enjoyed a monopoly until the early 1990s

when structural adjustment commenced throughout the economy. It was privatised in 2002 and Tanseed International emerged, producing seed using publically bred varieties from the CGIAR, with whom it has been working since 2006. It is also actively involved with farmers and the public sector (ACB, 2015b).

Tanseed was the first local company in Tanzania to produce its own seed. Since then it has tested other products, including hybrid rice with the AATF, together with Sokoine University of Agriculture (SUA) and the International Rice Research Institute (IRRI). This work has been funded by the BMGF. Tanseed is active in the promotion and dissemination of its products through its private extension service which works also with the Norwegian fertiliser company, Yara, to promote a package of seed, fertiliser and extension services. The company is looking to expand its operations into vegetable seed, and also to expand

regionally, into the DRC, Burundi and Rwanda, Mozambique and Madagascar (ACB, 2015b).

Tanseed received a direct grant of US\$ 167 000 from AGRA for the period 2007–2009, to work on improved seed for pigeon pea and sesame. In addition AGRA has provided significant extra resources to build the company, including sponsorship for training and education and the provision of ‘world class’ consultants to work in the business. Beyond AGRA, Tanseed is linked also to a number of other GR initiatives. The company has a G8 NAFSN commitment to produce nutrition-rich maize seed (i.e. to increase protein and Vitamin A content from 45% to 80%), as well as produce bean and soya as low cost sources of protein. It is currently using conventional breeding processes (ACB, 2015b).

REFERENCES

- AAFT. 2014. African Agricultural Technology Foundation and Syngenta Foundation for Sustainable Agriculture form partnership to help farmers in Africa grow more with better seed. 14 March 2014. Nairobi, Kenya.
- ACB. 2011. Heavy Hands: Monsanto in South Africa. Johannesburg: African Centre for Biosafety.
- ACB. 2012a. South Africa's Seed Systems: Challenges for food sovereignty. Johannesburg/Cape Town: African Centre for Biosafety/Trust for Community Outreach and Education.
- ACB. 2012b. The Pioneer/Pannar Seed merger: Deepening structural inequalities in Southern Africa. Johannesburg: African Centre for Biosafety.
- ACB. 2014. Running to stand still: Small-scale farmers and the Green Revolution in Malawi. Johannesburg: African Centre for Biosafety.
- ACB. 2015a. Profiting from the climate crisis, undermining resilience in Africa: Gates and Monsanto's Water Efficient Maize for Africa (WEMA) project. Johannesburg: African Centre for Biodiversity.
- ACB. 2015b. Nuanced rhetoric and the path to poverty: AGRA, small-scale farmers, and seed and soil fertility in Tanzania. Johannesburg: African Centre for Biosafety.
- ACB. 2015c. Which way forward for Zambia's smallholder farmers: Green Revolution input subsidies or agro-ecology? Johannesburg: African Centre for Biodiversity (ACB).
- Adler & Bell. 2015. We are the Solution: African women organize for land and seed sovereignty. 4 November 2015. Available at: http://otherworldsarepossible.org/we-are-solution-african-women-organize-land-and-seed-sovereignty?utm_content=buffer7co24&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer (accessed 12 October 2015).
- Advanta Seeds. Annual Report 2013/14. [online] http://www.advantaseeds.com/21st_Annual_Report_2014.pdf (accessed 14 July 2015).
- AfDB. 2014. African Development Bank to contribute to food security in 11 countries. AllAfrica 14 November 2014. <http://allafrica.com/stories/201411141148.html> (accessed 10 July 2015).
- AFSA. 2014. Acquisition of Africa's Seed Co by Monsanto, Groupe Limagrain: Neo-colonial occupation of Africa's seed. Media release by the Alliance for Food Sovereignty in Africa (AFSA). 8 October, 2014. Available at: <http://acbio.org.za/acquisition-of-africas-seedco-by-monsanto-groupe-limagrain-neo-colonial-occupation-of-africas-seed-systems/>. (accessed 13 July 2015).
- AFSA. 2014b. AFSA makes small gains for farmer's rights in Draft SADC PVP Protocol. [online]. <http://acbio.org.za/wp-content/uploads/2015/02/AFSA-Briefing.pdf> (accessed 11 November 2015).
- AFSA/GRAIN. 2015. Land and seed laws under attack: Who is pushing changes in Africa? [online] <http://afsafira.org/wp-content/uploads/2015/01/AFSA-GRAIN-Report-Africas-land-and-seed-laws-under-attack-who-is-pushing-for-changes.pdf> (accessed 29 July 2015).
- AFSA. 2015. ARIPO sells out farmers, seals secret deal on plant variety protection. 8 July 2015. Available at: <http://acbio.org.za/aripo-sells-out-african-farmers-seals-secret-deal-on-plant-variety-protection/> (accessed 30 July 2015).
- AFSTA. 2015. The African Seed (1). March 2015. Nairobi: The African Seed Trade Association (AFSTA).
- AGRA. N.d. Innovative finance. Available at: <http://agra-alliance.org/what-we-do/innovative-finance/>. (accessed 05 October 2015).
- AGRA. 2013. African agricultural status report: Focus on staple crops. Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).
- AGRA. 2015. Progress Report 2007–2014. Nairobi: Alliance for a Green Revolution in Africa (AGRA).
- Andae, G. State moves to bar former Kenya Seed bosses from AGM. Business Daily 7 January 2014. [online]. <http://>

- www.businessdailyafrica.com/Corporate-News/State-moves-to-bar-former-Kenya-Seed-bosses-from-AGM/-/539550/2137902/-/15p2fto/-/index.html (accessed 22 July 2015).
- AVRDC. 2014. Annual report 2013. Tainan: The World Vegetable Centre.
- Balton CP. N.d. Agribusiness. Available at: <http://baltoncp.com/Agribusiness> (accessed 13 July 2015).
- CABI. 2014. The good seed initiative: A strategy for CABI-led work on seed systems in sub-Saharan Africa and South Asia. [online] [http://www.cabi.org/Uploads/seed%20\(1\).pdf](http://www.cabi.org/Uploads/seed%20(1).pdf) (accessed 08 July 2015).
- CIMMYT. 2012. About the Improved Maize for African Soils Project. Available at: <http://www.cimmyt.org/en/projects/improved-maize-for-african-soils/about-imas-project> (accessed 22 July 2015).
- Chinsinga, B. 2011. Seeds and subsidies: The political economy of inputs programmes in Malawi. *IDS Bulletin* 42(4).
- Competition Tribunal SA. 2012. Judgment 28 May 2012 In the Competition Appeal Court of South Africa in the matter between Pioneer Hi-Bred International Inc., Pannar Seed (PTY) Ltd, The Competition Commission and African Centre for Biosafety. CAC CASE NO.: 113/CAC/NOV11. [online]. <http://www.comptrib.co.za/assets/Uploads/113CACNov11-Pioneer-Pannar.pdf>. (accessed 28 July 2015).
- CORAF/WECARD. 2014. Annual Report 2013. Dakar: West and Central African Council for Agricultural Research and Development. [online]: http://www.coraf.org/documents/publication/2014-06/annual_report_2013.pdf (accessed 20 July 2015).
- Correa, C *et al.* 2015. Plant Variety Protection in Developing Countries: A Tool for Designing a Sui Generis Plant Variety Protection System: An Alternative to UPOV 1991. APBEBES, 2015.
- CTA. 2014. Seed systems, science and policy in East and Central Africa. Wageningen, Netherlands: Technical Centre for Agriculture and Rural Cooperation (CTA).
- De Boef, W. 2015. Comprehensive approach to strengthening seed trade associations in Africa. Presentation given at AFSTA Congress, 5 March 2015. Victoria Falls, Zimbabwe. <http://afsta.org/wp-content/uploads/2015/03/Walter-Boef-Presentation.pdf> (accessed 23 June 2015).
- Deutsche Bank. 2015. Innovative public-private financing structures to improve food security in Africa: The Africa Agriculture and Trade Investment Fund (AATIF). Available at: <https://www.db.com/cr/en/concrete-Africa-Agriculture-Trade-and-Investment-Fund.htm> (accessed 03 August 2015).
- DAFF. 2014. South African variety list as maintained by the registrar of plant improvement: November 2014. Pretoria: Department of Agriculture, Forestry and Fisheries.
- DAFF. N.d. GMO permits issues. Available at: <http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Genetic-Resources/Biosafety/Information/Permits-Issued> (accessed 23 October 2015).
- Dano, E. 2007. Unmasking the New Green Revolution in Africa: Motives, players and dynamics. Penang, Malaysia: Third World Network/Church Development Service (EED)/African Centre for Biosafety.
- De Bruins, M. The evolution and contribution of plant breeding to global agriculture. Presentation given at the Second World Seed Conference, FAO Headquarters, Rome, September 8–10, 2009.
- De Vries and Toenniessen. 2001. Securing the harvest: Biotechnology, breeding and seed systems for African crops. Wallingford, UK: CABI publishing.
- DfID. 2014. DfID Impact fund: Fund snapshot—Injaro Capital Holdings. November 2014. http://www.theimpactprogramme.org.uk/wp-content/uploads/2014/11/Impact_Investment_Fund_Snapshot_Injaro_AW.pdf (accessed 28 July 2015).
- DuPont Pioneer. N.d. DuPont Pioneer in Africa & Middle East. Available at: https://www.pioneer.com/CMRoot/Pioneer/About_Global/news_media/pannar/Africa_FactSheet_FINAL.pdf (accessed 28 July 2015).
- DuPont. 2014. Annual report form 10-K. [online] http://investors.dupont.com/files/doc_financials/2014/5-Annual-Report-Form-10-K_v001_k98y7h.pdf (accessed 17 July 2015).
- East-West Seed. 2014. Annual report 2013/14. [online] <http://www.eastwestseed.com/upload/pdf/AnnualReport2014>.

- pdf (accessed 12/07/2015).
- Feed the Future. 2015. A new twist on seed technology. 29 January, 2015. Feed the Future Newsletter. Available at: <http://www.feedthefuture.gov/article/new-twist-seed-technology>; (accessed 22 July 2015).
- Grain SA. 2014. Grain SA Annual Report. Pretoria: Grain South Africa.
- G8 New Alliance Ethiopia Progress report 2013/14. <https://new-alliance.org/resources?type%5B%5D=Report>; (accessed 22/07/2015).
- G8 New Alliance for Food Security and Nutrition—Malawi—2014 Annual Progress Report <https://new-alliance.org/resource/2013-2014-malawi-new-alliance-progress-report>; (accessed 23 June 2015).
- Grow Africa. 2014. Agricultural partnerships take root across Africa. Geneva: Grow Africa Secretariat.
- The Herald*. 2014. Zimbabwe: Seed Co in US\$ 24 million boost. *The Herald*. N.d. [online]. <http://allafrica.com/stories/201412150341.html> (accessed 24 July 2015).
- Harvest Plus. 2015. Going global: Annual Report 2014. Washington, D.C.: Harvest Plus. [online] http://www.harvestplus.org/sites/default/files/2014%20HarvestPlus%20Annual%20Report_Web.pdf (accessed 29 October 2015).
- Howard, P. 2009. Visualising consolidation in the global seed industry: 1996–2008. East Lansing: Michigan State University.
- IFDC. 2015. Annual report 2015. Muscle Shoals: International Fertiliser Development Centre (IFDC).
- Ihucha, A. 2009. Arusha vies to become largest tropical vegetable seeds producer. *Arusha Times* 31 October–6 November 2009.
- ISAAA. 2015. Global status of commercialized biotech/GM crops: 2014. Ithaca, N.Y.: The International Service for the Acquisition of Agri-biotech Applications (ISAAA).
- Joy Business*. 2015. Seed Trade Association of Ghana formally launched. *Joy Business* 26 June 2015. [online] <http://www.myjoyonline.com/business/2015/June-26th/seed-trade-association-of-ghana-formally-launched.php> (accessed 20 July 2015).
- Kaskey, J. 2015a. Dow Chemical weighs options amid agriculture consolidation. *Bloomberg* 22 October 2015. [online] <http://www.bloomberg.com/news/articles/2015-10-22/dow-chemical-to-evaluate-options-of-agriculture-business> (accessed 02 November 2015).
- Kaskey, J. Monsanto says it's no longer considering bid for Syngenta. *Bloomberg* August 25 2015. [online]. <http://www.bloomberg.com/news/articles/2015-08-25/syngenta-gains-8-6-as-monsanto-said-to-increase-takeover-bid-idr9hpw4> (accessed 29 October 2015).
- Kenya Seed Company. N.d. Annual research field day newspaper supplement. Available at: <http://www.kenyaseed.com/images/docs/newsuppliment.pdf> (accessed 22 July 2015).
- Kesireddy, R.R. 2014. Indian hybrid seed makers eye East Asian markets. *Economic Times* 5 December 2014. [online] <http://economictimes.indiatimes.com/news/economy/agriculture/indian-hybrid-seed-makers-eye-africa-east-asia-markets/articleshow/45380263.cms> (accessed 10 July 2015).
- Keyser, J. 2013. Opening up the markets for seed trade in Africa. Washington, D.C.: The World Bank.
- Klein Karoo. N.d. Our History. Available at: <http://www.seedmarketing.co.za/index.php?p=8> (accessed 06 November 2015).
- Kloppenborg, J. 2004. First the seed: The political economy of plant biotechnology, 1492–2000. Madison, WI: University of Wisconsin Press.
- Kloppenborg, J. 2014. Re-purposing the master's tools: The open source seed initiative and the struggle for seed sovereignty. *The Journal of Peasant Studies* 41(6), pp. 1225–1246.
- Kotschi, J. and Wirz J. 2015. Who pays for seeds? Thoughts on financing organic plant breeding. Working Paper. AGRECOL and Section for Agriculture. Marburg and Dornach.

- KWS. 2015. Investor Presentation. Available at: https://www.kws.de/global/show_document.asp?id=aaaaaaaaaffxwn. (accessed 27 July 2015).
- Kuwuza, K. Seed sector collapses from foreign acquisitions. *Zimbabwe Independent* 14 August 2015. [online]. <http://www.theindependent.co.zw/2015/08/14/seed-sector-collapses-from-foreign-acquisitions/> (accessed 27 October 2015).
- La Via Campesina/GRAIN. 2015. Seed laws that criminalise farmers: resistance and fightback. Available at: <https://www.grain.org/article/entries/5142-seed-laws-that-criminalise-farmers-resistance-and-fightback> (accessed 12 November 2015).
- Lion, K.D. *et al.* 2015. Convening report: Multiple Pathways for Promoting the Commercial and Sustainable Production and Delivery of Early Generation Seed for Food Crops in Sub-Saharan Africa, 23 March 2015, London. Bill and Melinda Gates Foundation, Seattle, WA, and United States Agency for International Development, Washington, D.C.
- Lion, K. 2015. Synthesis Report of the Technical Review of the Early Generation Seed Study. Seattle: Bill and Melinda Gates Foundation.
- Louwaars, N. and de Boef, W. 2011. Integrated Seed Sector Development in Africa: A Conceptual Framework for Creating Coherence Between Practices, Programs, and Policies. *Journal of Crop Improvement* 26(1).
- Lynam, J. 2011. Plant breeding in sub-Saharan Africa in an era of donor dependence. *IDS Bulletin* 42 (4).
- MacRobert, J. 2009. Seed business management in Africa. Harare: International Maize and Wheat Improvement Centre (CIMMYT).
- Mali, S. 2014. Syngenta Foundation: sowing the seeds for stronger bean seed systems [online]. CIAT Blog 7 October, 2014. https://www.seedquest.com/news.php?type=news&id_article=54196&id_region=11&id_category=&id_crop=; (accessed 19 June 2015).
- Mokheba, T. and Khanyile, N. 2014. Syngenta to open second Africa research centre in Kenya in 2016. Bloomberg 8 May 2014. [online] <http://www.bloomberg.com/news/articles/2014-05-08/syngenta-to-open-second-africa-research-center-in-kenya-in-2016> (accessed 09 July 2015).
- Monitor Deloitte. 2015. Early Generation Seed Study. Available at: <https://agrilinks.org/library/early-generation-seed-study> (accessed 28 July 2015).
- Monsanto. N.d. Monsanto in Africa. Available at: http://www.monsantoafrica.com/who_we_are/monsanto_in_africa.asp (accessed 07 July 2015).
- Monsanto. Form 10-K. Delaware: Monsanto Company.
- Monsanto. 2015. Annual report. Delaware: Monsanto Company.
- Monsanto Annual report 2014. http://www.monsanto.com/investors/documents/annual%20report/2014/2014_monsanto_annualreport.pdf; (accessed 12 July 2015).
- Musoke, R. Civil Society sue Ugandan government for law that threatens farmers livelihoods. *The Independent*. 31 July 2015. [online]. <http://www.independent.co.ug/news/news/10480-civil-society-sue-ugandan-government-for-law-that-threatens-farmers-livelihoods#sthash.2lmCqZ9K.dpuf> (accessed 12 November 2015).
- Mwanawashe, C. 2015. Zimbabwe: Seed Co to venture into vegetable seeds. *Zimbabwe Herald* 3 February 2015. [online] <http://allafrica.com/stories/201502030470.html>; (accessed 10 July 2015).
- NAMC. 2012. Desktop view of the South African seed industry: A look at the value and different activities and role-players. Pretoria: National Agricultural Marketing Council (NAMC).
- Ntakhwana, O. 2015. Zamseed, BAMB partnership to benefit farmers. *Botswana Daily News* 8 June 2015. [online] <http://www.dailynews.gov.bw/news-details.php?nid=20662>. (accessed 28 August 2015).
- Odame, H, & Muange, E. 2011. Can agro-dealers deliver the Green Revolution in Kenya. *IDS Bulletin* 42(4).

- Pannar Seed. N.d. Changing of the guard in Pannar Seed's senior management team. Available at: http://www.pannar.com/news/detail/changing_of_the_guard_at_pannar_seed (accessed 30 October 2015).
- PMRC. 2015. Efficient water resource management for sustainable social and economic development. Lusaka: Policy Monitoring and Research Centre. [online] <http://www.pmrzambia.com/wp-content/uploads/2015/06/Efficient-Water-Resource-Management-for-Sustainable-Social-and-Economic-Development.pdf> (accessed 02 November 2015).
- Pop Vriend. N.d. The Story of Pop Vriend Seeds. Available at: <http://www.popvriendseeds.nl/about-us/our-story#nl> (accessed 13 July 2015).
- Pucci, J. 2015. DuPont Pioneer opens seed warehouse, office in Zambia. *Farm Chemicals International* 8 June 2015. [online]. <http://www.farmchemicalsinternational.com/crop-inputs/dupont-pioneer-opens-seed-warehouse-office-in-zambia/> (accessed 21 July 2015).
- Renaissance Capital. African agriculture: This other Eden. Sector report. 21 November 2011. Moscow: Renaissance Capital. [online] http://www.fastestbillion.com/res/Research/This_other_Eden-211111.pdf (accessed 29 June 2015).
- Rusike, J. 1995. The development of maize seed markets in sub-Saharan Africa. Washington, D.C: International Food Policy Research Institute.
- SADC Seed Centre. SADC Seed variety catalogue. Available at: <http://sadcseedcentre.org/index.php/catalog> (accessed 28 October 2015).
- Sakata Seed. N.d. History. Available at: <http://sakata.co.za/history/> (accessed 15 July 2015).
- Seed Co. 2015. Annual Report 2014. Available at: <http://seeds.seedco.co/profiles/investor/fullpage.asp?BzID=2050&to=cp&Nav=0&LangID=1&s=0&ID=12975> (accessed 10 July 2015).
- Seed Co. 2015b. Celebrating 75 Years of seeding Africa. Harare: Seed Co. [online] http://seeds.seedco.co/75th_anniversary (accessed 08 July 2015).
- Seed Quest. 2013. Limagrain opens up its capital to the the Crédit Agricole Group. *SeedQuest* 28 June 2013. [online]. http://www.seedquest.com/news.php?type=news&id_article=38354. (accessed 31 July 2015).
- Scoones, I. & Thompson, J. 2011. The politics of seed in Africa's Green Revolution: Alternative narratives and competing pathways. *IDS Bulletin* 42 (4).
- Sherry, S. DuPont bets on Africa's global food role with Pannar Seed deal. *Business Day* 1 August 2013. [online]. <http://www.bdlive.co.za/business/agriculture/2013/08/01/dupont-bets-on-africas-global-food-role-with-pannar-seed-deal>; (accessed 23 July 2015).
- Smale, M., Mason, N. 2013. Hybrid seed, income, and inequality among smallholder maize farmers in Zambia. *IAPRI working paper* 72. Lusaka: Indaba Agricultural Policy Research Institute (IAPRI).
- Smale, M. et al. 2013. The changing structure of the maize seed industry in Zambia: Prospects for orange maize. *Invited paper presented at the 4th International Conference of the African Association of Agricultural Economists*, September 22–25, 2013, Hammamet, Tunisia.
- Stiglitz, J. 2006. Making Globalisation work. New York: W.W. Norton and Company.
- Sutton, J. & Langmead, G. 2013. An enterprise map of Zambia. London: International Growth Centre. [online]. http://personal.lse.ac.uk/sutton/sutton_zambia_press.pdf (accessed 10 July 2015).
- Swanby, H. 2015. Cottoning on to the lie: the introduction of genetically modified cotton in Africa will harm, not help, smallholder farmers. Johannesburg: African Centre for Biosafety. [online]. <http://acbio.org.za/wp-content/uploads/2015/06/GM-Cotton-report-2015-06.pdf> (accessed 10 July 2015).
- Syngenta. 2015. Annual review 2014. Basel: Syngenta AG.
- Syngenta. 2014. Our Industry 2014. Basel: Syngenta AG.
- Syngenta. N.d. Syngenta Opens new state-of-the-art herbicide filling plant. Available at: <http://www3.syngenta.com/country/za/en/syngenta/NewsCentre/news-snippets/Pages/Syngentaopensnewstate-of-the-artherbicidefillingplant.aspx> (accessed 09 July 2015).

- SFSA. 2015. Seeds2B: Scaling up smallholders' access to and adoption of improved technology. Syngenta Foundation for Sustainable Agriculture (SFSA). [online]. http://www.syngentafoundation.org/__temp/o6o22o15_Seeds2B.pdf (accessed 13 July 2017).
- Kablan, A. et al. USAID Tropical soybean for development workshop. 28 October, 2014. Available at: https://agrilinks.org/sites/default/files/resource/files/soybeanslidesMaster_1o2814_1.pdf (accessed 20 July 2015).
- UPL. 2015. Annual report 2014/15. [online]. <http://www.uplonline.com/annualreports/fy14to15.php> (accessed 21 July 2015).
- Van Mele, P. et al. 2011. African Seed Enterprises: Sowing the Seeds of Food Security. Walingford, UK: CABI International.
- Vilmorin & Cie. 2013. Results for the fiscal year 2012/13. Available at: http://www.vilmorin.info/vilmorin/CMS/Files/Reunions_Information/pres_resultats_annuels_12_13_gb.pdf (accessed 17 July 2015).
- Vilmorin & Cie. 2015. Investors presentation. Available at: http://www.vilmorin.info/vilmorin/CMS/Files/Investors_presentation_May.pdf; (accessed 30 July 2015).
- Visser, J. 2015. Monsanto targets smallholder farmers. *Farmers' Weekly* 8 January 2015. [online]. <http://www.farmersweekly.co.za/article.aspx?id=67535&h=Monsanto-targets-smallholder-farmers> (accessed 07 July 2015).
- Voxtra. N.d. Investment Portfolio. Available at: <http://voxttra.org/portfolio/> (accessed 29 July 2015).
- World Bank. 2009. Awakening Africa's sleeping giant: prospects for commercial agriculture in the Guinea Savannah zone and beyond. Washington, D.C.: The World Bank.
- World Bank. 2012. Agribusiness indicators: Zambia. Washington, D.C.: The World Bank
- World Bank. 2013. Agribusiness indicators: Kenya. Washington, D.C.: The World Bank.
- World Bank. 2014. Agribusiness indicators: Synthesis report. Washington, D.C.: The World Bank.
- World Bank. 2015. Enabling the business of agriculture: progress report. Washington, D.C.: The World Bank.
- The Herald*, Zimbabwe. 2015. Seed Co takes over Prime Seeds. *The Herald* 12 June 2015. [online] <http://www.herald.co.zw/seed-co-takes-over-prime-seeds/> (accessed 26 October 2015).
- Sunday Mail*, Zimbabwe. 2014. Seed Co looks to West Africa growth. *Sunday Mail* 21 December 2014. <http://www.sundaymail.co.zw/?p=21820>; (accessed 17 June 2015).



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