Africa's food security: learning from success

Building on agriculture best practice for regional food security

Food security trends in Africa have declined markedly as a result of the combined effects of the food crisis and the global economic downturn. The number of people facing hunger in the region grew to 265M in 2010, a rise of nearly 50M since 2000.

The most vulnerable have been forced to adopt coping strategies in the face of declining access to food. Reducing food consumption, selling household assets to acquire food and switching to less nutritious food groups are common approaches used to beset the negative impact of rising food insecurity. Against this backdrop of deepening food crises, developing effective food security frameworks and promoting successful models of agriculture best practice has never been more urgent.

Successful examples of agriculture best practice offer a means to enhance current food security frameworks. Promoting and disseminating success stories from the field is vital for ensuring the efficient allocation of limited resources and avoiding the pitfalls of previous interventions. Critically best practice examples provide the opportunity to scale up innovative and effective

approaches in order to improve future sectoral performance. Poverty reduction through technical support and income generation for smallholder farmers has been prioritized as paramount to achieving food security for poor rural households. Technical assistance has focused on the transfer of new technology and approaches with the aim of boosting crop productivity

Poor networks of infrastructure and extension across Africa have restricted the potential for scaling up successful agricultural models. This has been compounded by falling public investment in agricultural development as a proportion of official development assistance. Agriculture receives less than 5% of total development aid to Africa (FAO).
Despite limited funding, significant advances have been made in the field of crop research where new varieties and hybrid seeds have been developed to increase productivity and build tolerance against pests and crop diseases. Investments in crop research and development have had a substantial positive impact on sector performance. West Africa's transition as a world leader in cassava production is largely attributed to the adoption of improved varieties of planting materials, following the footsteps of maize expansion in Eastern and Southern Africa.

Agriculture sector performance in Africa

African agricultural performance has stabilized after a period of relative decline. Improvements in productive capacity have occurred alongside growth in regional trade and domestic markets. Conversely Africa's agriculture sector has failed to meet food demand pushed up by higher population growth. Widening growth patterns across agricultural markets and beyond a limited selection of export based crops is likely to be critical for efforts to improve regional food security (Wiggin 2005).

Moreover, improvements in domestic demand have contributed to a marked increased in the production of staple crops and importantly the higher value products demanded by more affluent consumers. Though agricultural growth demand generated by the state is less prevalent today, strategic investments by parastatal boards for cereals, cattle and milk has been influential in strengthening domestic food markets (ibid).

The development of maize, cassava and rice markets in Africa have been pivotal to turning around regional agricultural performance. Cassava production has increased three fold since independence. Attention has now shifted to how farmers can maximize benefits from cassava's transformation from hunger to cash crop. Delivering the balance between strategic investment and sustainable funding frameworks is underlined in the example of the maize revolution in East and Southern Africa, which was heavily dependent on government support to smallholder networks and investments in national research institutions. Lastly the importance of technological advances in the field of crop productivity has been highlighted in the innovative advances achieved through the NERICA brand.

All three case studies below point to the importance of enhancing the participation of smallholder farmers in the implementation of food security programmes and the promotion of sustainable rural development approaches that focus on long term interventions.

Rice - The NERICA story

In comparison with Asian and American competitors, productivity in Africa local rice production falls well below the international average, failing to meet local demand. Asia accounts for 77% of rice exports however its dominance of the rice market is likely to contract as a result of rising population trends which will substantial increase domestic demand post 2020.

Conversely Africa accounts for 32% of rice imports and is regarded as a major player in the international rice trade with the consumption of rice doubling yearly. In West and Central Africa rice demand is growing at a rate of 6% per annum equaling 8M tonnes. This has contributed to an 11% increase in rice imports.

Rice makes an important contribution to nutrition, providing 27% of energy and 20% of daily dietary requirements, therefore making it an "ideal entry point for reducing poverty" (WARDA 2007).

Since its arrival as a breakthrough hybrid rice in the late 1990's, NERICA has been aggressively promoted as a solution to Africa's low rice productivity rate by leading development agencies including AGRA, JICA and WARDA, Africa's most prominent rice research centre.

NERICA is produced by crossing Asian and African rice varieties with the goal of combining the yield related attributes of Asian type with the benefits from local adaptation of the African variant. Its main focus is on raising productivity, income and enhancing food security of rain-fed upland rice farmers. NERICA trials have proved largely successful, so much that the 6% increase in rice harvests achieved in 2003 has been

partially attributed to NERICA's introduction (ibid.)

Introduction of 18 NERICA varieties was supported through informal channels and established development projects, including a $35M NERICA dissemination project funded by ADB starting in 2004.

NERICA is characterized by strong stems able to support heavy heads of grain, early maturity (recorded on average as 30-50 days earlier than existing varieties), drought tolerance, pest resistance and tolerance to acidic soils. NERICA has also been shown to be responsive to inorganic and organic fertilisers. Studies have revealed NERICA can perform stable yields under low and high input conditions, reducing the risk for smallholder farmers of clearing land without achieving favourable crop harvests (WARDA 2008).

NERICA was promoted using the process of Participatory Varietal Selection (PVS). This involves determining the varieties that farmers want to grow, allowing the monitoring of gender difference in selection, and enhancing learning with regards to the traits farmers value in breeding and selection. More than 4000 farmers participated in 17 WARDA countries across Africa.

In Guinea, the first PVS phase began in 1997 with support from the World Bank. Participation in the trial phase was high with 20,000 farmers taking part. . NERICA achieved a 40% diffusion rate and a 53% adoption rate. Results showed that following the adoption of NERICA seeds farmers gained an additional $2.5M in income and harvested 15,000 tonnes of rice covering an area of 8,000ha (ibid).

In Cote D'Ivoire, the diffusion rate for NERICA was 9% while the adoption rate was only NERICA 4%. WARDA projections estimate that adoption would have increased to 27% if the population had been adequately exposed to the NERICA brand. Adoption rates reached 86% in Gambia and 70% in Benin.

Determinants of adoption were dependent on a range of factors including whether farmers were cash croppers, household size, age and participation in household trials.

Results on the yield performance of NERICA were wide ranging. While in Cote D'Ivoire NERICA achieved an additional 741kg/ha for women farmers, on average farmers in Guinea achieved only 491 kg/ha. In Benin NERICA performed exceptionally well achieving an additional 1587kg/ha.

According to WARDA, NERICA's positive impact was reflected at household level with key gains achieved in relation to household income and poverty rates. Figures show that the deficit ration of the poorest reduced by 19% and that NERICA adoption led to the improvement in household living conditions and school attendance attributed to improved household consumption expenditure per adult. This had the highest impact in female headed households.

The main drawbacks to NERICA appear to be limited farmer exposure to the product and the inability of local seed production to meet farmer demands. Prior to 2000 the majority of NERICA seed diffusion was confined to research activities, though the involvement of major development partners like JICA and AGRA have currently enhanced seed distribution networks.

Aside from NERICA's improved coverage, limited government capacity to roll out NERICA technology has been cited as a key factor in the failure to scale up NERICA diffusion.

In response to NERICA's success concerns have been raised about the effect of the widespread adoption on the viability of local seed systems, some of which have been featured in local ecosystems for centuries.

GRAIN points to the threat that this agricultural model may have on preserving genetic diversity. In a study of 98 households in the Mogbuama district of Sierra Leone, 59 rice varieties were shown to be used through a process of mixed farming where farmers typically cultivate a dozen crops on one ha delivering average yields of 4 tonnes per ha. Concerns have been raised over the neglect of peasant seed systems in the process of integrating NERICA hybrid seeds. A 2003 survey conducted on 1700 plots in Guinea showed that 80% of varieties grown were traditional reflecting the dominance of local seed types. NERICA currently requires its seeds to be adopted in isolation in order to avoid contamination with other seed varieties, potentially threatening smallholders' access to mixed farming approaches.

The CGIAR has also questioned the NERICA drive arguing for caution before initiating large scale seed distribution. CGIAR claims that evidence for the heat and drought tolerance of NERICA is under question while its effects on yield are largely heterogeneous.

Wider concerns relating to the marketing of NERICA rice point to the continued challenge of rice subsidies in the developed world which restrict access of African rice farmers to international markets. In comparison to the 200M investment received from the ADB to promote NERICA regionally, US rice farmers receive 1.4BN in subsidies per annum (WARDA, 2007).

Failure to protect farmers against liberalization and high input costs are likely to dampen the potential benefits that the adoption of new technologies like NERICA can offer.

Cassava: Transforming the hunger crop

The transformation of cassava from its promotion as a crop produced during drought periods, to its role as a strategy in the replacement of rice and wheat imports has been exceptional and carried out in little over a generation. Cassava known as the 'food security crop' for its ability to achieve high yields in tough planting conditions, is the most important food staple in Nigeria and Benin and comes only after rice in Sierra Leone.

Cassava production in Africa reached 25.8 million tonnes in 1990 expanding to 52.3 million tonnes by 2004.

Two third of regional production is sourced from Nigeria, where 39,3 million tonnes are grown annually, making it the largest producer of cassava in the world(IITA 2009). Agriculture policy reforms featuring the removal of maize and import subsidies have favoured investments in cassava production.

Cassava has carried out a transformative role as a powerful poverty fighter due to its ability to grow in adverse cropping conditions often without applied inputs. In drought prone Southern Africa, cassava farming has boomed as a result of its ability to achieve good harvests without substantial rainfall. Cassava trails have shown that good yields can be maintained without utilizing fertilizer, demonstrating clear gains for low income rural households. Labour constrained HIV/AIDS households have also benefited from cassava farming due to its flexible planting and harvesting calendar, allowing the possibility of non farm employment (Hagblade 2004).

However cassava production has been most successful where mechanized processing is practiced. Cassava production using mechanization processes produces returns of up to 20 times greater than those achieved with traditional practices (ibid).

Cassava's success can be partially attributed to advances in pest and disease management. Improved methods of controlling the mosaic disease and bacterial blight through the breeding of resistant cassava varieties have helped reduce crop losses and achieve higher productivity. Advances in pest management, particularly biological control of the mealy bug is reported to have reversed crop losses of up to 80%. Additionally improved varieties developed by agricultural research agency such as IITA in Nigeria have improved the profitability of cassava investments.

The relative reduction in production, processing and harvest costs for cassava have led to suggestions of further cassava expansion particularly in the area of exports i.e. cassava pellets for livestock which has global appeal. Encouraging prospects for cassava indicate that it will remain an important source of foreign exchange for some time to come.

Cassava as a versatile crop can be processed into several secondary products of industrial market value. The shift from cassava production for home consumption to commercial production is a reflection of the diverse utilization of cassava into a range of products for consumers and industry. Conversely the manufacturing sector in Africa has thus far failed to fully exploit cassava's potential as low cost raw material.

Studies have shown the availability of improved processing equipment is related to the expansion of land cleared for cassava production. In Ghana and Nigeria results reveal that where farmers have access to mechanized cassava graters their incentives for planting cassava increased leading to a rise in area planted (FAO, 2004). A new trend of hired labour for cassava production has also become common in Ghana and Nigeria. The need for labour saving, high yielding technologies is substantial as urbanization fuels demand for cassava products i.e. gari, cassava paste and cassava chips.

Gari is the most consumed and traded of cassava food products. Considerable demand for gari has been reached throughout West Africa with gari production expanding into central and Northern Nigeria, Sierra Leone and Benin., This has presented labour opportunities for rural women in Sierra Leone who have shifted to gari milling.

Export market potential for processed cassava is reflected in the establishment of nice markets for products such as 'Instant Fufu', a popular food item for immigrant families located in the West in addition to–middle class consumers in urban centers. In response to expensive wheat imports, high quality cassava flour (HQCF) has been introduced as a composite in bakeries in order to reduce wheat import bills. This policy was applied more widely in Nigeria, whereas in Benin and Sierra Leone only a small proportion of baked goods use HQCF.

Nigeria

Nigeria has the largest cassava market in the world, producing nearly 40 M tonnes per annum. Out of total cassava production, 16% was used as industrial raw material in 2001 compared to 10% used for animal feed. An additional 5% was processed into syrup concentrate for soft drinks and less than 1% used for HQCF. The remaining 84% (29M tonnes) is reserved for food consumption. Cassava has emerged as the food of choice even in urban areas where demand has increased substantially. The domestic food market has the largest potential growth for cassava production at approximately 20 M tonnes.

Cassava processing can be divided into four main types, household or cottage based production, micro, small and medium/large. Cassava processing operations that fall under medium to large scale are scarce in Nigeria due to the absence of innovative cassava processing technologies. The lack of standardizing weights and measures also make efficiency assessments difficult (FAO 2004). Medium scale factories have undertaken cassava processing into HQCF and high grade fufu for export have been established by local entrepreneurs e.g Peak Products, Vesa Farms and Abeokuta.

Cassava starch is used widely in food and non food industries. In Nigeria it used as an ingredient in manufactured goods (e.g. glucose, confectionary, alcohol) and in non food industries e.g. adhesives and textiles. Cassava starch is highlighted as an example of income generation for small scale producers. Large scale processors include the Nigeria Starch Mills and the Matna Starch industry that are leading players in the domestic starch industry supply goods to international companies such as Cadbury and Nestle Plc.

Examples of commercial processing in Nigeria have revealed the importance of local production as determining factors in ensuring the viability of large scale operations. Securing the supply of cassava in a domestic market where cassava is a staple crop continues to pose problems for cassava processing companies where they are unable to ensure access to raw cassava resources (FAO 2004).

A highly successful Nigeria government cassava initiative was launched in 2003 which aimed to promote entrants and investment into cassava micro processing while simultaneously engaging in small and large scale processing industries. Successful models for state agro-processing and marketing expansion of cassava have been carried out in Imo State, which has facilitated stakeholder training and capacity development while promoting linkages with industrial end users.

The Integration Cassava Project (ICP) run by IITA was implemented in Southern Nigeria focusing on commercializing cassava production through the planting of high yield varieties tolerant to cassava mosaic disease (CMD) Results showed that yield doubled from 11 t/ha to 25 t/ ha. Newly bred varieties were multiplied on more than 500 ha by IITA, and other research groups (IITA 2009).

Areas for improvement of Nigeria's cassava industry cover issues of improved quality control and standardization and enhancing consumer and industrial awareness about the benefit of cassava processing. Government has a key role in ending market inefficiency through improvement to public goods and delivering investments to rural infrastructure. Building partnerships with industry are also likely to be advantageous to improving the competitiveness of cassava relative to alternative inputs e.g. maize.

Learning from Africa's Maize Revolution

Historically, maize has performed strongly in East and Southern Africa as a consequence of successful maize breeding and the use of new crop hybrids. New high yielding varieties have experience significant expansion. Currently 58% of maize crop areas in Eastern and Southern Africa include maize hybrids and outyield conventional techniques by 40-50% (IFPRI, 2004).

Targeted investment in Kenya and Zimbabwe national crop research has been pivotal in securing achievements in maize production. In 1960, Zimbabwe released the first commercially grown single cross maize hybrid in the world.

Additional support has included collateral support for smallholders involving the expansion of state marketing infrastructure in order to allow agencies to disburse subsidized inputs based on credit flows to smallholders.

Heavy subsidies were also provided for industrial maize meal. Subsequently maize production fell dramatically once these subsidies were withdrawn.

Between 1900-1965 the expansion of maize markets in Eastern and Southern Africa were attributed to the demand created by British starch markets during the colonial era, the availability of milling technology and the

integration of Africans into the settler economy (IFPRI 2003). The emergence of maize as a dominant staple crop in East Africa is also associated with the rise of commercial farming lobbies who placed significant influence on the direction of agricultural policy.

Successful commercial lobbying by settler commercial farmers who were able to secure assistance from the colonial government, (that incorporated protection from international market and smallholder competition), was pivotal in providing strategic investments for the development of the maize sector.

As part of support to settler farmers parastatal crop buying station were established offering above export prices for maize. However this initiative was not scaled up to benefit smallholder farmers.

Commercially funded maize research programs were set up in Kenya and Zimbabwe leading to the development stream of highly productive conventional and non conventional hybrids thus contributing to steady maize yield and output gains. Malawi achieved hybrids well suited to the need of smallholder farmers- who were prone to replanting saved seeds and processing and consuming on farm grain.

Support for smallholders involved the expansion of input and marketing support institutions. State agencies were able to disburse subsidized input on credit to smallholders and then subsequently recover loans through farmer sales to state marketing boards.

Marketing of grain in remote areas was supported by the policy of building networks of cooperative marketing depots leading to reduction in transports costs. National strategies for maize self sufficiency also promoted the subsidization of the retail price of industrial maize which increased domestic consumption. Highly subsidized input supply and marketing systems accounted for up to 5% of GDP in Kenya and Zambia.

Systemic debt eventually caused the system to collapse. By 1990 over 80% of Zimbabwe's farmers were in arrears (IFPRI 2004). Losses to unpaid debt became a crippling financial drain on state resources contributing to calls for liberalization reform.

A decline in maize subsidies combined with drought, poor sectoral management and public funding decline for national research led to a marked reduction in production trends. The number of new crop varieties stalled signaling the loss of key research personnel. Increased input costs followed the withdrawal of state buying stations and the loss of farmer incentives causing dramatic falls in production. In Kenya maize production growth fell from 3.3% in 1965-80 to -1.5% between 1990-2000 and 1.9% to -2.4% in Zambia for the same period (ibid).

The combination of drought and the shift to 'crisis motivated food and agricultural policies' (IFPRI 2004), caused greater alliance on food aid, only exacerbated by poor coordination of the wider food system by NGOs and donors (ibid).

Key lessons for building on the success of maize investments reflect the need for sustained investments in agricultural research and the consequence of failing to implement viable input and credit delivery systems. Crucially early successes of the maize sector were attributed to producer institutions built up by settler farmers which built an effective coalition of political pressure for public and private investment for maize development.

Groote et. al. (2002) study on the Africa's maize revolution showed that utilization of improved maize technologies was partially related to the

availability of extension services in ensuring that new approaches were adopted. In Ethiopia, research showed that market access proved paramount to accepting new seed variants. The study further highlights the wider constraints for the development of maize markets in the sub region citing the reduction of input costs through the promotion of the role of private institutions. Furthermore emphasis was placed on improvements to infrastructure and transportation and enhancing credit availability for small holders.

Implications for policy markers

In all case studies presented, effective management and coordination of commodity markets proved essential to sector performance. Governments with the support of development agencies must address ways to maximize the potential opportunities within their agriculture sectors by identifying areas for expansion and investment.

Supporting farmers by improving access to critical productive inputs such as seed and fertilizer should remain a key priority for government in delivering hunger and poverty reduction targets for low income rural communities. The importance of input distribution in improving crop outputs was clearly demonstrated in the maize case study where government investments were fundamental to productivity gains.

Macroeconomic policy reform is also another area where governments can make an impact particularly in the area of market liberalization. The achievements reported in the NERICA case study where productivity improved markedly, can only be maximized where domestic rice markets are protected from cheap rice imports.

Balancing the need for open rice markets with the demand to build domestic rice capacity should be a priority for government in the medium term whereby many efforts are made toward investment in rice industries, improving post harvest processing and quality assurance.

Government must continue to promote agriculture research not only by building capacity within national research instititutions but by developing closer linkages between the research centres and the field through the expansion of extension service provision. Closing the gap between farmers and the research community can only improve the uptake of agriculture technology especially in remote rural areas.

Lastly Nigeria's success in cassava processing was largely a result of a positive relationship between the private and public sector with the government taking a proactive role in engaging small and large scale processing industries. Developing close relationships with the private sector should be a priority for government, attempting to add value to basic agriculture commodities and increase market returns to the rural poor.

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