

Effecting change through private sector client services for smallholder farmers in Africa

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Abstract

Smallholder crop management practices throughout sub-Saharan Africa still lag behind those of small-scale farmers in Asia and Latin America. During the past 50 years public and private sector investments in agricultural research, extension, and input and output markets have expanded. Starting in the late 1980s, 40 of the 47 African countries implemented economic policy reforms under structural adjustment programs to transfer responsibilities from public to private organizations, and use market forces to drive agricultural development. Globalization of input and output markets can allow African smallholders to catch up by tapping into production technologies and knowledge around the world. Yet the majority of smallholder farmers continue to use traditional and often unproductive crop production practices.

This paper summarizes recent developments and emerging trends in the organization of crop management research and development and technology delivery systems in African countries. The paper draws insights from the transaction costs and principal agent theories of the New Institutional Economics on the potential role of the private sector in inducing widespread adoption of improved crop management practices by smallholders. The paper applies the implications to case studies of targeting private sector-led development in Tanzania and Malawi and Zimbabwe in order to identify efficient incentive mechanisms for inducing widespread technological change where contract enforcement is difficult. The paper finds that there is a large public role to ensure that contract farming arrangements are conducted fairly and this, in turn, induces output market development, which pulls new technologies and facilitates adoption by farmers.

Media summary

Smallholder crop management practices in sub-Saharan Africa are lagging behind those of small-scale farmers in other parts of the world. Private sector participation through contract farming can create incentives for farmers to adopt new farming methods.

Keywords

Non-governmental organizations, economics, public sector, incentives, market forces, technology delivery

Introduction

Smallholder crop management practices throughout sub-Saharan Africa continue to lag behind those of small-scale farmers in Asia and Latin America. African smallholders still use traditional practices, with limited use of improved varieties, quality seed, inorganic fertilizers, pesticides, tractors, and irrigation (Table 1). Although Africa has some difficulty to manage agro-ecological areas, it is not inherently lower in potential than other continents (Plucknett, 1993). Africa has low yields mainly because of its extremely low inorganic fertilizer use. To achieve yield gains needed to meet food requirements of the rapidly growing population, Africa must significantly increase its current low levels of inorganic fertilizer use and intensify its production systems (Adesina, 2001). A recent study of crop management in semi arid West Africa found that there has been significant technological change, mostly in the production of export crops and maize, which has a strong domestic trade (Sanders and Shapiro, 2003). Significant potential exists to make impact even in more difficult regions where the poor are concentrated by resolving constraints on introducing rapid technological change, particularly inefficient farm input and output markets and limited product markets for traditional food crops (Sanders and Shapiro, 2004).

Table 1: Agricultural input use and average cereal crop yields in sub-Saharan Africa, Asia, South America, Europe and North America

	Average annual fertilizer use (kg per hectare) 1995-97	Pesticide use (grams per hectare of cropland) 1996	Tractors (number per 1,000 hectares cropland) 1997	Irrigated land as a percentage of cropland 1997	Average cereal Crop yields (kg per hectare) 1996-1998	% change in crop yields 1986-88 to 1996-1998
Sub-Saharan Africa	12	242	2	4	997	2
Asia	139	2,508	12	34	2,608	17
Europe	66	2,372	11	9	2,740	34
South America	89	3,071	36	8	3,030	18
North America	134	1,122	25	10	4,744	24

Source: World Resources Institute

Beginning in the late 1980s, 40 of the 47 African countries implemented economic policy reforms in agriculture. In many countries, governments implemented a mix of public investment and policies to encourage private sector development and new forms of public-private-nongovernmental organizations (NGOs) partnerships in order to speed up technological change. Private sector-driven agricultural research and development (R & D) and technology dissemination in African countries has been promoted by donors because of failure of public sector-driven approaches and the belief that markets provide high-powered incentives that motivate private sector managers to work harder than public sector managers. Under structural adjustment, the government was expected to exit input markets and let the private sector take over. This has not happened. Can the private sector play a role in improving resource management of smallholders? Is access to resources or knowledge on resource use the main limitation? What success has been achieved in targeting the private sector?

This paper summarizes recent developments in the organization of crop management technology delivery in Africa. The paper draws insights from the transaction costs theories of the New Institutional Economics on the potential role of the private sector in promoting adoption of improved crop management practices by smallholders. We present case studies from Africa in which the private sector has entered into contractual arrangements with smallholder farmers and rural traders to supply domestic and international markets and improve access to production inputs. We examine the actions and outcomes for various stakeholders in order to identify efficient incentive mechanisms for inducing technological change, particularly in those situations where contract enforcement is difficult.

Organization of smallholder crop management research and technology delivery in Africa

During the past century, the public sector – ministries of agriculture, research stations, extension services, agricultural training institutes, state marketing boards, cooperatives and parastatals – have been the key change agents for smallholder agriculture.

In Southern and Eastern Africa government agricultural departments were set up beginning in the early 1900s, initially to conduct crop improvement research and extend technologies to large-scale commercial farmers. Commercial farmers widely adopted hybrid maize seed, fertilizers and tractor mechanization in the 1950s and 1960s. Public investments were then expanded to diffuse hybrid and fertilizer technologies to smallholders. Extension departments experimented with various models to induce smallholders to “abandon their primitive methods of cultivation” and adopt science-based methods (Alvord, 1956). Significant investments were made in extension services; the share of extension expenditure in total government agricultural spending was higher in Africa than in Asia (Benyon, 1998). Although effective in getting farmers to adopt first-generation technologies such as tillage, improved varieties, planting methods, crop rotations and use of animal manure, public programs were not effective in promoting the adoption of information and knowledge intensive technologies such as composted manure, improved fallows, inorganic fertilizers, and pesticides. National research and extension programs (NARSs) were too top-down and designed without farmer participation; too centralized to take into account differing environmental and socio-economic conditions; elitist, concentrating on better resource-endowed farmers; too inflexible and not responsive to market and climatic changes; supply driven rather than demand

driven; not accountable to farmers, nor farmer empowering; and expensive because of high managerial slack and bureaucratic bloat (Byerlee, 1998; Rukuni, Blackie and Eicher, 1998). Perhaps one of the best examples of the ineffectiveness of the research and extension systems in Africa is the case of declining soil fertility. This problem was recognized as the most binding constraint as early as the 1930s, when population growth led to a decrease in fallowing and shifting cultivation (Nyasaland Protectorate, 1930; Southern Rhodesia, 1944; Engledow, 1949). Seven decades later, low soil fertility still remains the major constraint (Sanchez *et al*, 1997; Mapfumo and Giller, 2001).

With the advent of structural adjustment in the early 1990s, most government agricultural research and extension programs suffered significant budget cuts. At the same time there was a decline in donor support and private sector funding. Poor salaries and working conditions led to declining public research and extension staff morale, loss of staff to the private and NGO sectors, and loss of community respect. In many countries there also have been substantial public extension staff losses resulting from AIDs.

In the mid-1990s, several countries implemented Agricultural Sector Investment Programs (ASIPs) funded by the World Bank and other donors to restructure public sector research and extension organizations to focus on their core functions, privatize non-core functions, commercialize and introduce cost recovery for services (Eicher, 2003). Private firms were expected to expand their investments in research and extension, input supply, product assembly, processing and export. Local traders in particular were expected to participate in local grain assembly, transportation and storage. The received wisdom was that markets would work. But market liberalization has not benefited most smallholders. Because of high transportation costs, lack of credit and storage facilities, poor telecommunications and risks in supplying small-scale farmers, agricultural input manufacturers and rural traders have not expanded their investments. Farmers have poor access to input and output markets and to new technologies – since most technology is embodied in purchased inputs. Formal credit programs have collapsed and smallholders lack capital to purchase inputs. Output markets have become poorly organized, with high transaction costs resulting from poor market information, poor infrastructure, weak farmer organization, poor grades and standards, and poor contract enforcement. Because of disorderly markets, smallholder farmers are exploited, fail to benefit from commercialization, and stop producing marketable crops.

Concerns with slow expansion of commercial input supply given declining soil fertility and increasing food insecurity have renewed interest in government-run programs (Kelly *et al* 2003). Government input distribution programs face a number of problems, including political interference, ineffectiveness of means-targeting, sizable leakages, procurement and distribution delays, and inadequate farmer training that reduce the effectiveness of the package. For example, during the 1998/99 and 1999/2000 cropping seasons, Malawi implemented an extensive seed and fertilizer distribution Starter Pack program for all smallholders to plant 0.1 ha of maize/legume intercrops. Because of budgetary constraints, the Starter Pack was changed in 2000/01 and 2001/02 to the Targeted Input Program (TIP). The Malawi Government and many donors considered the Starter Pack and Targeted Input Program food security successes. But the programs became expensive and extremely donor driven. The programs failed to address the problems of poverty and lack of purchasing power underpinning the food security problems and missed opportunities to build private sector systems for supplying farm inputs (Kelly *et al* 2003). The Malawi Government is now exploring using the Starter Pack and Targeted Input Program to complement development of agro-dealer networks being carried out by the Citizens Network for Foreign Affairs (CNFA) and the International Fertilizer Development Center (IFDC) with support from the Rockefeller Foundation and United States Agency for International Development (USAID).

As in developed countries, private firms are expanding investments in agricultural technology development and dissemination. Despite these constraints, several large seed, fertilizer, and pesticide firms conduct research and offer commercially based extension services to large-scale commercial farmers, and on-farm demonstrations and strip trials to smallholders. In Zimbabwe and Zambia commercial farmers' associations set up private research stations in the 1980s and 1990s, providing facilities for agribusinesses to test seed, agrochemicals, fertilizers, farm machinery, and irrigation equipment. The stations conduct research on a contract basis and fund themselves by contract research and commercial produce sales. The Commercial Farmers' Union of Zimbabwe established in-house research and extension teams funded through levies and member subscriptions. Similarly the Zimbabwe

Farmers' Union, which represents smallholders, began to employ extension specialists. New farmers' organizations are being set up in Malawi and Tanzania.

International Agricultural Research Centers (IARCs), including International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Maize and Wheat Improvement Center (CIMMYT), International Center for Research in Agro-Forestry (ICRAF), International Institute of Tropical Agriculture (IITA) and *Centro Internacional de Agricultura Tropical* (CIAT-TSBF) have over the past decade expanded their investments in crop management research in partnership with the national research systems, farmers and NGOs. A recent study by Ryan and Spencer (2001) found that the IARCS are being motivated by the decline in public sector support for their research and the likelihood of enhanced impact. There is a demand by the private sector for direct relationships with IARCs, which has proved so effective in the past in providing parental breeding lines and these relationships should be promoted in the future. An expert survey of success stories in African agriculture found that the most commonly cited soil fertility enhancement success was the improved fallow system with nitrogen-fixing leguminous shrubs developed by ICRAF in partnerships with national programs in Kenya, Malawi, Zambia and Zimbabwe (Gabre-Madhin and Haggblade, 2003). To date the greatest impact has emerged in Southern Africa where about 20,000 farmers in the Zambezi basin currently practice these fallow systems though similar efforts are under way in East and West Africa. Micro-dosing of inorganic fertilizer technologies developed by the national agricultural research program of Niger, ICRISAT, IFDC and farmers starting in 1996 was being applied by 5,000 farmers in 2000 following the inventory credit system supported by the FAO (Abdoulaye, 2002; Ndjeunga *et al*, 2003). Fertilizer micro-dosing is being extended with inventory credit into Mali, Burkina Faso and neighboring countries by several donors with technical backstopping by ICRISAT, CIAT-TSBF, IFDC and NGOs (Sanders and Shapiro, 2004).

NGOs have also responded by providing agricultural extension and training at village level; conducting on-farm research; and providing extension services in collaboration with government staff and agribusiness firms. NGOs, especially church-based organizations, are becoming increasingly involved in distribution of drought relief food and agricultural inputs and information. It seems desirable for national and international R & D organizations to more explicitly involve themselves with NGOs in their natural resource agendas in the future (Ryan and Spencer, 2001). Although NGOs have thousands of staff and better engage farmers' participation in development, they have been criticized for lacking scientific and technical expertise to complement their dialogue with poor people at the grassroots level (White and Eicher, 1999; Ryan and Spencer, 2001). Some analysts have argued for caution in partnerships with non-governmental organizations because NARS partners are sensitive to partnership with NGOs in conducting research since they are perceived as lacking research capabilities (Anderson, 2000).

In the coming years public research and extension budgets will likely continue to fall in real terms. Operations may need to be funded through non-traditional sources such as the private sector, farmer organizations and NGOs. Research and extension will become more system-oriented, demand driven, farmer empowering and community and knowledge sharing. There is a growing trend in the high potential areas, and for cash crops in all areas, towards privatization and commercialization of extension services: private agribusinesses and farmer associations supplying farmers with inputs and information, linked to producing products with specified traits. This arrangement could increase competitiveness of smallholder agriculture. In low potential areas, and for the poorest households, NGOs and grassroots organizations are expanding famine relief programs, distributing of inputs and agricultural information to help households recover from natural disasters. Still these programs could make use of private firms in the distribution of inputs to farmers.

Conceptual framework for analyzing the role of the private sector in improving smallholder crop management

In the 1950s, economic historians and institutionalists were important figures in debates on alternative development strategies for developing countries. But with the shift of the economics discipline to growth modeling in the 1960s, the field narrowed and debates focused on industrialization. Starting in the 1980s, institutional economics has been revived as a general, macroanalytical approach and applied to address how alternative sets of organizations and rules affect economic behavior, resource allocation, and performance; and contractual arrangements for organizing production and exchange (Eggertsson, 1990; Williamson, 1985; North, 1990).

New institutional economics posits that every transaction is a contract and there is a range of property rights structures from private property and market exchange to state property and central management that is compatible with each general type of economic system and that, in the absence of transaction costs¹, only organizations and rules that optimize a nation's wealth and productivity growth evolve. However, shirking, cheating, renegeing, incomplete contracts, ill-defined property rights, information and agency costs give rise to transactions costs, thus preventing optimal rules from evolving automatically. Consequently, society's choices of property rights determine economic performance.

Crop management technologies are a bundle of services that are linked together from initial information gathering and sorting, through R & D, production, financing, marketing, to servicing farmers.² The services have several attributes that make the way a nation chooses to organize activities for supplying them, affect the structure and level of transaction costs and the performance of the crop management technology delivery systems. Different property rights arrangements will have different production effects as well as different distributional consequences.

Modern science and technology is organized in multiple and interconnected layers: core sciences; pretechnology sciences; applied sciences; and technology development, screening and commercialization of inventions (Huffman, 1992). There is a wide variety of organizations that societies have devised to perform activities in various layers: government agencies; private businesses; cooperatives; commodity groups; IARCs and NGOs; and combinations of these. These have different competencies to lower the transaction costs that R & D and technology dissemination involves, including costs of coordination and contract enforcement. Government agencies have non-transferable common ownership rights by citizens. In contrast, private businesses have voluntarily transferable, exclusive ownership rights by shareholders. Cooperatives and commodity groups have nontransferable but redeemable exclusive rights by customers. Nonprofit organizations have no residual claim rights and are funded by donors who do not seek a financial return on their contributions, but want to support a certain type of activity.

The general implication of this framework is that the questions that farmers, public policy makers and private sector managers are facing in the crop management technology delivery system in the short and medium term are about how to supplant or supplement currently predominant public forms of organizations with new public-private, public-public, private-private and public-private-nonprofit structures to improve the efficiency and cost-effectiveness of R & D, and accelerate technology dissemination within the region in order to achieve profitability and national food security goals. In the long-term farmers, policy makers and private sector managers face the question of what institutional blending they can undertake to combine the strengths of different component organizations without combining their weaknesses.

We explore the implications from the framework for the private sector-led technological pathway to effect technological change in smallholder farming using case studies. The case studies are drawn from a variety of situations and crops in Tanzania, Malawi and Zimbabwe.

Case studies of private sector led dissemination in sub-Saharan Africa

Few case studies of field crop production exist to draw upon and document the success of smallholder crop management practice-changes that has been achieved by targeting the private sector. This is because in many African countries the experience of private sector participation in agricultural technology supply, input and output marketing is still relatively new compared to Asia and Latin America.

¹Transaction costs consist of resources expended on finding other parties to transactions, standardizing quality, spoilage and posturing costs during negotiation, verification and resolving disputes.

²The value-added chain theory developed in business management conceptualizes a product as a bundle of services that are linked together from project discovery and evaluation, through product and process design, production, market testing, development and cultivation.

Pigeonpea production and marketing in Tanzania and Malawi: Cash Spot market to Forward Deliverable Contracts

Pigeonpea production in Tanzania and Malawi is geographically concentrated. In Tanzania the major producing areas are Babati in the north, Kondoa in the central region, and Mtwara and Lindi in the southern coastal areas. In Malawi the major production areas are in the south, mainly because of the low prevalence of animals. In the major growing areas, 90% of farmers grow the crop, and 70% are “commercial”, selling over half their production.

Studies of the international pigeonpea market have shown that it is highly globalized, very competitive, and dominated by India: the major producer and consumer (Lo Monaco, 2003). The major determinants of competitiveness in the Indian market are timing, quality and price. Trader interviews also show that there is a marketing window for exports from Tanzania and Malawi, which opens around August to September and closes in October or November (Rusike *et al*, 2003). Subsequently, prices drop because the crops in India and Myanmar are harvested. This is an opportunistic market. Buyers look for grain color, size and milling characteristics, including ease of dehulling, shape, cleanness, and uniformity. White grains are preferred and fetch premium prices. Babati White from northern Tanzania and white pigeonpea varieties from Malawi have a unique taste that Asian and European customers like; and this explains why exporting firms are still surviving. In terms of grain size, market requirements vary. Indian millers prefer small to medium-grained varieties such as Babati White, while European millers require large-sized grains. Moreover, size requirements can change rapidly from large to small because of shifts in milling technology. Compared to Myanmar and India, Malawi and northern Tanzania produce better quality pigeonpea (Table 2). However, pigeonpea from central and southern Tanzania and Mozambique is mostly red in color and poor in quality because of insect damage. Infestation begins in the field and eggs and larvae are carried over into storage, and cause high losses. Quality is determined largely by farmers’ production practices, particularly variety choice, seed quality, planting time and spacing, weeding, soil fertility management, pest control, harvesting, threshing and post-harvest management. Quality is also determined by the grades and standards set by intermediaries in the marketing chain and by exporters during final cleaning and processing. Export demand and prices depend largely on production in India – demand and prices for African pigeonpea are high when there are difficult growing conditions and poor crops in India and Myanmar (Lo Monaco, 2003).

Table 2: Grain quality traits relevant for the pigeonpea milling industry

	Africa	Myanmar	Yellow pea
Grain size	Medium to large	Small to medium	Large
Grain shape	Round	Round	Round
Ease of dehulling	Low	Fair	Very high
Cleanness	High	Low	High
Weeviled grains	Fair	High	Low
Homogeneity	High	Low	High
Average yields %	65-70	65-75	90

Source: Lo Monaco, 2003

ICRISAT and national scientists in Tanzania and Malawi have developed improved varieties with white bold grain. These include ICPL 87091, liked by Indian millers and others preferred on the European market. These varieties are suitable for cultivation by small-scale farmers aiming to service the August-to-November export market to India. ICRISAT and NARS scientists have also developed a range of crop management options (intercropping, planting date, spacing and plant arrangement, soil fertility and pest management) designed to fit the different resource endowments, investment strategies, and risk management practices of different smallholders (Snapp *et al*, 2003). ICRISAT farm management surveys conducted in Tanzania and Malawi show that use of these management options along with the new varieties enables farmers to obtain premium prices for their grain (Rusike *et al*, 2003).

To improve marketing outcomes for smallholders, the United States-based NGO TechnoServe in collaboration with NARS and ICRISAT intervened during the 1999/2000 and 2000/01 seasons. TechnoServe trained local buyers on sorting and grading; helped organize farmers’ business groups and trained them on marketing strategies; provided seed of ICEAP 00040; linked farmer groups to local buyers and commercial exporters; and promoted payment of premium prices for quality delivered to buyers – thus encouraging farmers to sort their grain on-farm. But the appointed commercial buyer

developed monopsonistic market power, did not reward farmers for quality and failed to compete with itinerant buyers. Another factor contributing to this failure was spot market for trading commodities (Rusike *et al*, 2003).

The entry of private traders in Tanzania and Malawi following liberalization of agricultural markets increased pigeonpea area, yields, production and exports. For example, in Kondoa district in Tanzania, pigeonpea is now a major cash crop, following an expansion of research and extension and private traders over the last five years (Figure 2). Farmers used to grow pigeonpea on a small scale; production expanded when they adopted the white-seeded *Kombowa* (ICPL 87091) and crop management methods developed by ICRISAT and Selian Agricultural Research Institute. Because of increased availability of *Kombowa* grain, traders came in from the neighboring Babati district, where pigeonpea was already highly commercialized. Farmers found they could earn high incomes from pigeonpea, and expanded production further, attracting even more traders. Farmers have become much more receptive to new technology, adopting improved crop management practices especially farmyard manure, inorganic fertilizers, pesticides and ox-drawn ploughs and rippers to incorporate crop residues into the soil to increase fertility and this is seen with doubling of average grain yields doubled in 2001 and 2002 seasons.

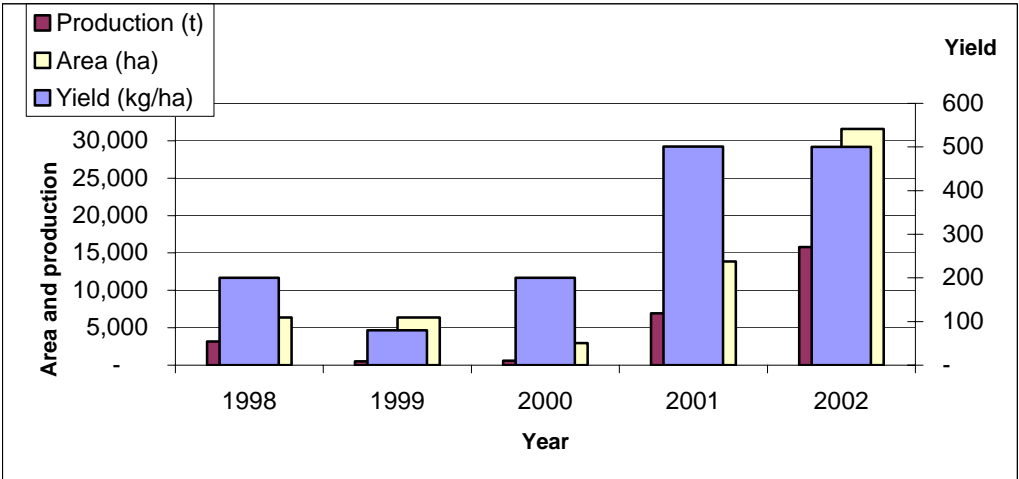


Figure 2. Pigeonpea area, production and yield in Kondoa District, Dodoma
Source: District Agricultural Extension Office, Kondoa

In Malawi, pigeonpea area, yields and production began to increase in 1985/86 following the availability of seed of the ICP 9145 variety. However, area and productivity increased rapidly in 1993 following the entry of private traders (Figure 3). The high productivity observed for the 2001-2003 is indicative of improved management practiced by smallholder farmers.

Marketing, institutional and policy failures are major constraints to expanded production and exports. Trader interviews revealed that both domestic and international markets are very volatile because domestic consumption of dry pigeonpea is negligible and most produce is exported. Tanzanian and Malawian traders need to obtain confirmed orders with specified prices before they start buying from farmers. They then buy the crop, transport grain to export centers, clean, pack, and export it before prices in India start to fall. Before declaring prices to farmers, traders take into account bagging costs, transportation, handling, cleaning, port charges, freight, local levies and cess, corporate tax, corruption and harassment charges, and financial costs.

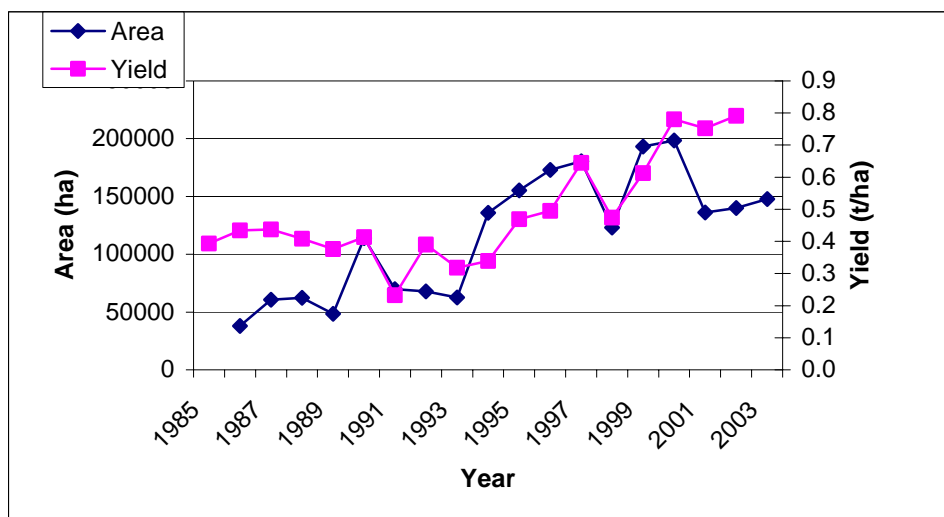


Figure 3. Pigeonpea area and yield in Malawi, 1986-2003

Source: Ministry of Agriculture and Irrigation

An increase in any of these cost elements is passed down to smallholder farmers because the farm level-derived supply is highly inelastic in any given season. Exporters are reluctant to hold inventory stocks because of prices in India are uncertain. Because Indian traders have monopsonistic market power and can drive prices down, exporters cannot assure farmers the contracted prices, and cannot forward-contract with farmers. Prices can drop by as much as 20% from the start to the end of the marketing season. At the beginning exporters are uncertain of demand and offer farmers low prices. When exporters obtain confirmed orders, prices increase from October towards November and then fall. An increase in production results in a slump in prices. Traders can be stuck with pipeline inventory and lose money. If traders go back to farmers and announce lower prices, farmers react with suspicion.

There is an increasing trend towards use of forward deliverable contracts in place of spot cash purchases for organizing production and marketing. Globalization of pigeonpea markets has resulted in increasing competition from Myanmar and yellow peas from Canada and France. This is affecting the competitiveness of Tanzanian and Malawian pigeonpea, based on price rather than quality. Opportunities exist for exporters to target niche markets with high quality peas; but quality will depend on the farmers' and marketing intermediaries' capabilities and effort. But exporters are not currently using incentive-compatible contracts. Hence farmers have no incentives to maintain or improve product quality by adopting improved varieties and crop management practices

Trader interviews reveal that marketing contracts between exporters and farmers could resolve seed shortages; circumvent middlemen, reduce marketing margins and inspection costs when buying; and control quality through more timely harvesting and better grading by farmers. This would permit both farmers and exporters to get better prices based on quality. Contracts could also permit exporters to secure a high volume supply of uniform products and generate economies of scale during assembly, storage, processing and transportation. However, there are constraints to putting such contracts in place. For example, commercial companies face high contractual transaction costs negotiating individual contracts with numerous smallholders each producing a small quantity. Farmers face high collective action transaction costs organizing themselves into large associations for collective bargaining. Farmer and trader interviews indicate that public investments are needed to help farmers form associations; guide them in seed production and make seed available at competitive prices; strengthen farmers' bargaining power; and help control collusion and market power among exporting firms.

Contract smallholder groundnut production in Zimbabwe: Rank Tournaments

Although groundnut is grown throughout Zimbabwe, commercial production is concentrated in the north eastern and eastern districts, where environmental conditions allow profitable groundnut production in competition with maize and costs of transporting grain from farmers to shelling and export centres are not prohibitive. Export markets are mainly regional to South Africa and parts of Asia where quality requirements on aflatoxin contamination is not so strict. Zimbabwe permits 20 parts per billion. As with pigeonpea, quality is determined largely on-farm by crop management practices.

Trading firms have been developing contract production and marketing arrangements to improve the quality and supply of groundnuts procured from smallholders in Zimbabwe, generate economies of scale, reduce marketing costs, and increase competitiveness in international markets. One example of this is the company Reapers which began operations in 1993 as a joint venture between the Commercial Oilseed Producers Association (COPA), large-scale commercial farmers, and the Seed Company of Zimbabwe to produce groundnut seed and market the by-products. In 1998 Reapers was acquired by private investors and began contract groundnut production with smallholders. It now has contract growers in all major production areas. Reapers supplies seed and fertilizer to contract growers on credit, to be repaid after harvest. Reapers uses a voluntary tournament group approach with individuals monitoring contractual arrangements. Farmers are approached as a group in order to safeguard investments in inputs and training and use peer pressure to monitor each other. The group committee reduces transaction costs of communication with farmers, delivering inputs and collecting outputs. At the same time the company makes an individual contract with every farmer in the group because an individual contract obliges the farmer to repay credit, reduces free-riding, and facilitates contract enforcement through the courts. Individual contracts and competition among farmers enable the company to identify the best farmers; for example some may be given more inputs the following season, others may be dropped from the program. The company employs its own extension agents, provides crop management advice through the radio, and sets up demonstration plots. This facilitates inspection by the company's international buyers as they visit and inspect the crop when it is still in the field. In addition, the company helps farmers to obtain crop and life insurance. During the marketing season Reapers buys other crops, including sunflower and maize.

Production and marketing contracts began to develop during the 1992/93 season, when the government decontrolled groundnut marketing and permitted private firms to establish contracts with farmers and provide technical assistance, seed, and marketing services. Private traders were also allowed to import and export groundnut. These reforms initially led to a proliferation of low quality imports from China because there were shortages in the domestic market following the 1991/92 drought. Until the early 1990s, groundnut plantings were declining because of poor prices, low returns compared to competing crops, lack of seed, high labor requirements, and lack of credit for farmers to purchase fertilizers and pesticides. The national average yield was declining due to lack of adoption of improved crop management practices. Following the entry of private firms, both the area planted and national average yield have increased (Figure 4). Groundnut used to be a woman's crop, primarily grown for food security. But now men dominate production decisions, and for some households groundnut has become the main crop. Trader interviews revealed that farmers, especially contract growers, have increased their use of inorganic fertilizers.

ICRISAT worked with Seed Co and Reapers to develop *Nyanda*, a high-yielding variety with characteristics demanded by international buyers. But Reapers is unable to ensure adequate supplies of quality product for the international market. Marketable surpluses from the smallholder sector have been very low for the past 4 years because of drought and poor prices – commercial contractors frequently offer lower prices than informal markets. Because of fluctuations in marketable surpluses, exports have been erratic. Smallholders were able to produce output for export equivalent to when the commercial sector was dominant in the early 1990s (Figure 5).

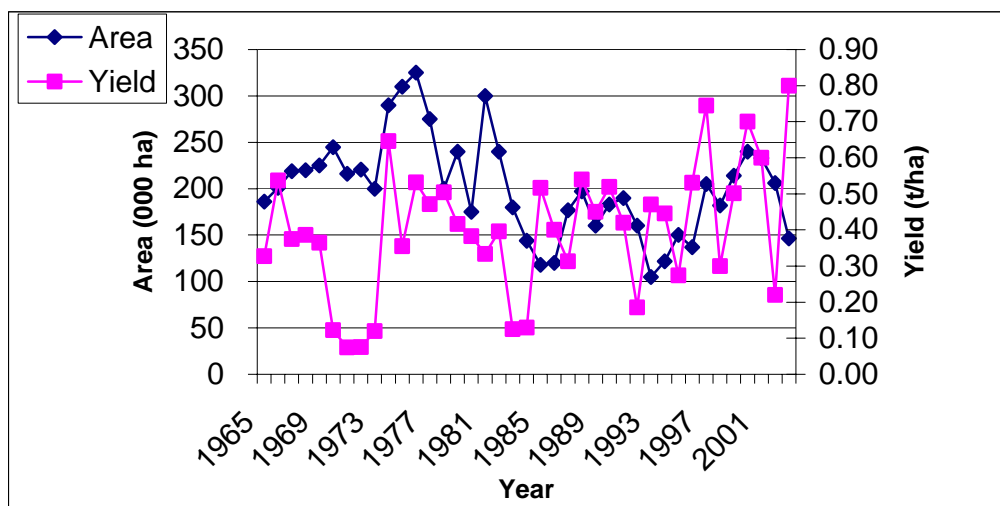


Figure 4. Smallholder groundnut area and yield in Zimbabwe, 1965-2003

Source: Ministry of Lands, Agriculture and Rural Resettlement

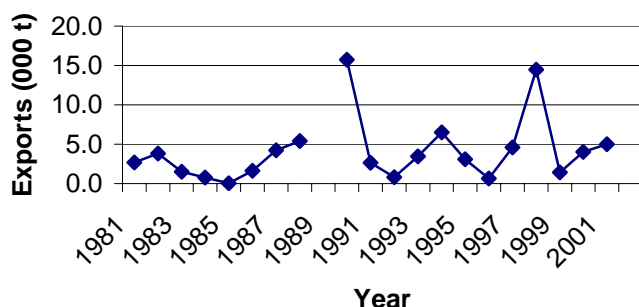


Figure 5. Groundnut exports, Zimbabwe, 1981-2001

Source: Ministry of Lands, Agriculture and Rural Resettlement

CARE Zimbabwe Agribusiness Entrepreneur Network and Training (AGENT) Program: Hostage Model
 Before economic reforms were implemented in Zimbabwe in 1990, there was a well-coordinated system for supplying inputs to farmers and marketing outputs. One seed company supplied all the seeds planted by farmers, two fertilizer companies marketed all the fertilizer compounds used in the country. Over 70% of seed, fertilizer, and agrochemicals were distributed to smallholders through supply and marketing cooperatives that had a monopoly on credit provided through the parastatal Agricultural Finance Corporation. Over 90% of the grains were purchased and marketed through the parastatal Grain Marketing Board (GMB).

This system broke down because of budgetary cuts imposed under structural adjustments. For example, the GMB reduced its depots from 74 to 26 in 1995. Supply and marketing cooperatives collapsed; currently they handle less than 5% of seed and fertilizer sales to smallholders. Over 50% of all agricultural inputs are now purchased by farmers directly from the fertilizer companies or their distributors in urban centers.

During the 1995/96 season, CARE in collaboration with the African Center for Fertilizer Development (ACFD) and fertilizer firms, began to establish a network of rural agro-dealers in Zimbabwe. The aim was to improve access to inputs; lower transaction costs and prices of inputs; provide agricultural information through rural traders; and encourage greater use of inputs to increase productivity, farm incomes, and livelihoods (Mahove, 2003). The program has evolved through three phases. During the first phase, rural dealers were identified in consultation with local authorities and community leaders; and trained in product knowledge, warehousing, handling, stock management, credit management, record keeping, marketing and customer care. CARE then sourced inputs from regional wholesalers, purchased and took title, and supplied the inputs to the dealers on a "just-in-time" consignment basis. This system was modified and expanded during the 1997/1998 season. CARE now supplied stockists, who then supplied the rural dealers. But the system still depended on CARE for guarantee and direct delivery. To

reduce dependency on CARE and make the supply system sustainable, the channels were further modified in the 1998/99 season. Input manufacturers directly supplied regional wholesalers, who then supplied agents who in turn sold the inputs to farmers. Trade credit is high risk and a major limiting factor in the development of smallholder agriculture. Because there is no social obligation to repay credit, input manufacturers and wholesalers will not provide credit without hostages. CARE provides hostages in the form of credit guarantees for agents to wholesalers and manufacturers. Eventually, as the business relationship develops, rural traders are expected to graduate to receiving credit directly from manufacturers.

To date over 800 dealers have been trained and more than 80% of these graduated to direct relationships with agricultural input manufacturers and wholesalers. Some traders are dropped by suppliers because of poor management of accounts, especially late payments and defaulting. Recently Zimbabwe's economy has been faced by input shortages resulting from price controls and shortages of foreign currency, parallel markets, high inflation and interest rates. Many private firms have stopped extending credit to rural traders. CARE is experimenting with business management organizations to aggregate capital and purchases. CARE has also engaged trained rural traders to distribute emergency agricultural recovery seed and fertilizer inputs to selected farmers.

Input manufacturers are establishing their own dealers, based on the models pioneered by CARE and ACFD. But private sector development is biased to high potential areas, where risks and transaction costs are low. For example, the two major fertilizer companies ZFC and Windmill have established more than 250 traders as stockists, mostly in the high potential areas. These stockists receive consignment stocks without security and without making immediate cash payment for the delivery. They pay for the goods and transport cost after sale to farmers. Despite getting seed and fertilizer credit without security, some dealers still failed to pay. Trade credit still remains a high risk especially without hostages. Rural traders also develop location monopolistic powers and charge high markups on products. This explains why smallholders have recommended government to expand investments to strengthen their countervailing power and thus reduce monopolistic behaviour by rural traders in outlying areas.

Conclusions and recommendations

Smallholder crop management practices in sub-Saharan Africa are lagging behind those of small-scale farmers in other parts of the world. While significant technological change has occurred, mostly in export crops and maize, opportunities exist to make impact even in more difficult regions where the poor are concentrated. Historically, public sector agencies have been the key change agents for smallholder agriculture. However, there is an increasing trend towards private sector and public-private-NGO partnerships for research and extension, input supply and output marketing. These changes have already occurred in Asia, Latin America and Europe, and North America.

The New Institutional economics predicts that private sector participation through contract farming can create incentives for farmers to adopt new technologies and for private sector to expand investments in technology delivery linked to improving competitiveness in domestic, regional and international markets. The general implication of this framework is that the questions that farmers, public policy makers and private sector managers are facing in the crop management technology delivery system in the short and medium term are about how to supplant or supplement currently predominant public forms of organizations with new public-private, public-public, private-private and public-private-nonprofit structures to improve the efficiency and cost-effectiveness of R & D, and accelerate technology dissemination within the region in order to achieve profitability and national food security goals. This was explored through case studies of private sector-led development: pigeonpea in Tanzania and Malawi, groundnut in Zimbabwe, and agricultural input marketing in Zimbabwe.

The Tanzania and Malawi pigeonpea case illustrates effecting change through private sector client services for smallholders by shifting from cash market transactions to contracts, to capture higher economic rents within the marketing channel resulting from globalization of pigeonpea markets and new genetic and crop management technologies. The case of groundnut in Zimbabwe demonstrates the impact achieved by targeting private companies using contracts to engage farmers to produce a quality crop that can earn premium prices in international markets. The case of agricultural input supply in Zimbabwe

demonstrates the use of hostages to provide safeguards for input manufacturers' investments in credit in areas where trade credit is highly risky because of lack of social obligation to repay.

Four main conclusions can be drawn from the study. First, there exists a range of cash and non-cash crop management technologies that if applied to most smallholder farming could greatly increase yields. Second, adoption is more likely if dissemination is linked through contracts to producing products that are demanded by buyers in domestic, regional and international markets and that enable farmers to obtain premium prices. Third, private firms have significant potential to improve smallholder crop management practices and productivity, by supplying farmers with new cultivars, nutrients, pesticides, farm equipment, information, capital, and other services; drawing on research results from around the world. Fourth, market, institutional, government, and policy failures currently limit expanded private sector participation. There is a large public role to ensure that contract farming arrangements are conducted fairly and this, in turn, induces output market development, which pulls new technologies and facilitates adoption by farmers.

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