

How Institutions Mediate the Impact of Cash Cropping on Food Crop Intensification: An Application to Cotton in Sub-Saharan Africa

VERONIQUE THERIAULT and DAVID L. TSCHIRLEY*

Michigan State University, East Lansing, USA

Summary. — It is widely agreed that smallholder-led agricultural growth would contribute most to improved food security and reduced poverty. Yet, how to achieve broader and more sustainable access by smallholder farmers to productivity-enhancing inputs for food crop production remains a largely unsolved riddle. In light of the great institutional diversity across cotton sectors in Sub-Saharan Africa, this study investigates whether cotton can be used to spur the intensification of smallholder food production. First, a conceptual framework linking cotton institutional structures to food crop intensification is developed. Then, predictions from the conceptual framework are compared with empirical evidence from different countries.

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1. INTRODUCTION

The worldwide food price crises of 2007–08 and 2011, and continuing high prices for most agricultural commodities to this day, have led to a renewed focus among governments and donor agencies on agricultural growth, especially growth in staple food production in Sub-Saharan Africa (SSA). There is widespread agreement that growth in smallholder agriculture, if it can be achieved, will result in the broadest-based growth that contributes most to improved food security and reduced poverty (Christiansen, Demery, & Kuhl, 2011).¹ It is also widely agreed that achieving such growth requires much broader access by smallholders to improved input packages, such as improved seed and fertilizer and to the technical advice needed to use them properly. Yet, how to achieve broader and more sustainable access by smallholder farmers to productivity-enhancing inputs for food crop production remains a largely unsolved riddle.

From the 1960s through the mid-1980s, the main approach to spurring such access relied on state-controlled enterprises distributing fertilizer, and to varying degrees, other inputs such as improved seeds at subsidized prices. Although this model led to an increase in fertilizer use in SSA (FAOSTAT, 2013), its financial sustainability became a growing concern. In the mid-1980s, input market reforms started to be implemented with the aim of reducing state control over the price and distribution of inputs and encouraging private input market development (World Bank, 1981). After a period of sharply reduced subsidies, policy reforms, and other attempts to develop private input distribution systems, many governments have been unsatisfied with the level and rate of progress. As a result, the past ten years have seen a dramatic renewal in the use of input subsidies focused on staple grain production. Most of the current programs claim the smart subsidy label, implying an attempt to avoid the failures of the earlier state-implemented programs by featuring collaboration with the private sector.²

There is evidence that some of these programs have succeeded in increasing production and yields of selected staple grains among smallholder farmers for some periods of time (Druilhe & Barreiro-Hurle, 2012). Still, major questions have been raised about the financial sustainability of the programs

and about their impact on the development of private sector input distribution systems that could provide a robust, long-run solution to the problem. In fact, today's programs, many based on input vouchers, suffer from some of the same problems of the earlier unsustainable centralized subsidy programs, including late delivery of fertilizer, displacement of private sector input dealers, and very high total costs (Minot & Benson, 2009; Ricker-Gilbert & Jayne, 2008).

These findings about new subsidy programs along with continued underdevelopment of private input systems and low use of inputs on the continent, raise the question of whether cash cropping structures in SSA can be used to spur the intensification of smallholder food production more efficiently, and with greater positive impact than has generally been the case even with the new smart subsidies.

There is a longstanding debate in economic development concerning the impact of cash crops on food crop intensification. On the one hand, critics claim that reforms promoting market liberalization and exports have undermined local food production by diverting scarce resources from food crops to cash crops. A common claim is that cash crops are usually grown on the most fertile land, displacing food crops to more marginal land (e.g., Mittal, 2009). On the other hand, advocates of cash cropping argue that they play a key role in fostering agricultural development and in inducing economic growth. Cash crops strategically produced on the basis of comparative advantage are said to significantly increase household incomes and foreign exchange earnings (Timmer, 1997).

This study focuses on cotton, which is the most widely produced cash crop by African smallholder farmers and which has been at the core of the food versus cash crop debate in SSA. In some studies cotton has been depicted as “the mother of poverty” (Isaacman, 1980). In contrast, other studies have

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described cotton as being “the white gold” (Dione, 1989; Tefft, 2010), since it is a major source of export earnings for governments and of income for smallholder farmers. There are several instances where governments and private-public collaborations have explicitly used cotton – and the institutional structure that surrounds it – to promote broader agricultural productivity.³

In light of the great institutional diversity across cotton sectors on the continent, this study examines how the particular institutional structure of a cotton sector might affect its ability to spur such growth in food crop intensification. The conceptual framework developed in the paper may have relevance beyond cotton, as it depends not only on the characteristics of the crop itself but also on the institutional structure in which it is grown and marketed and which are known to exist also for other cash crops.⁴

The study makes two important contributions to the literature. First, it explicitly examines the institutional details that might allow cash crop production to make a financially sustainable contribution to food crop intensification. To our knowledge, no other study has unpacked the institutional story in such comparative fashion.⁵ Second, it extends the food crop question to the cotton sector typology first developed by Poulton *et al.* (2004) and further developed by Tschirley *et al.* (2010), Tschirley, Poulton, and Labaste (2009). No study has yet elaborated on the implications of these structures for food crop intensification.

The paper proceeds as follows. The first section draws on previous research to highlight the range of institutional structures governing cotton production in SSA and to show how these structures drive cotton sector performance. Then, a conceptual framework for linking cotton institutional structures to the challenge of promoting food crop intensification is developed. The framework consists of (a) a typology of pathways through which cotton may spur food crop intensification, and (b) predictions as to the impact of varying cotton sector institutional structures on the likelihood that a given pathway will exist and be sustainable. Drawing on the literature, experience from 13 countries across the continent is reviewed and expectations that emerge from the conceptual framework are assessed against available evidence. The final section concludes with a brief assessment of the framework’s performance against evidence, and initial suggestions regarding policy implications.

2. INSTITUTIONAL STRUCTURES GOVERNING COTTON PRODUCTION IN SUB-SAHARAN AFRICA

Tschirley *et al.* (2009, 2010), building on Poulton *et al.* (2004), identified five types of cotton sectors on the African continent, based on the structure of the market for the purchase of seed cotton and the regulatory framework in which firms operate. Figure 1 lays out the typology in a decision-tree framework. The typology is first based on a distinction between market-based and regulated sectors, with the latter referring to sectors in which free competition for seed cotton purchase is not allowed. The second distinction is based on the number of buyers of seed cotton: many or few in the case of market-based systems, and one or more than one in regulated systems. These two distinctions generate four sector types: (1) national monopolies, (2) local monopolies, (3) concentrated market-based systems, and (4) competitively structured systems. A fifth category, hybrid market structures, captures the sectors that cannot be classified into one of the four main types.

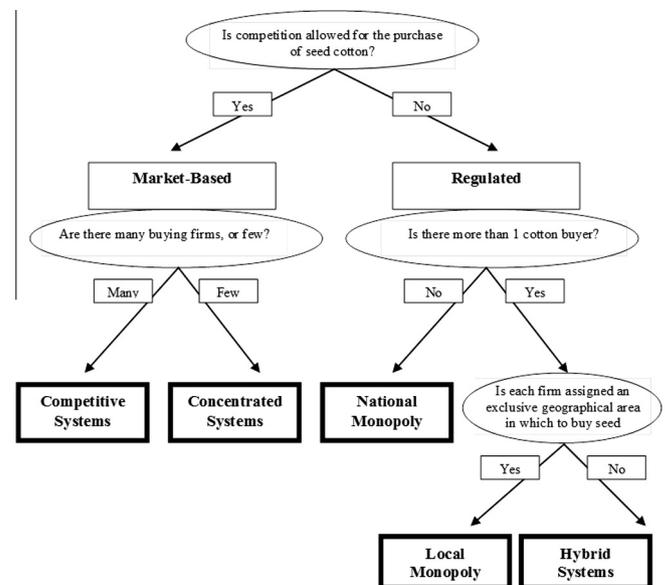


Figure 1. Cotton sector typology in decision tree framework from Tschirley *et al.* (2009).

In Cameroon, Chad, Mali, and Togo, cotton sectors remain managed by a national monopoly responsible for purchasing all cotton from farmers at fixed pan-regional prices. Cotton sectors in Burkina Faso, Ivory Coast,⁶ and Mozambique are organized into local monopolies, where exclusive purchasing rights are given to one ginning firm within a delimited geographical zone. Concentrated market structures define cotton sectors, such as in Zambia and Zimbabwe until at least the early 2000s, in which a very small number of firms (two in these particular examples) dominate market share but face free competition from other firms and, potentially, from each other. Unlike local monopolies, concentrated sectors have no geographical zoning that delimits firms’ scope of operations. In competitively structured sectors, such as in Tanzania since 1994, Uganda during the first years of liberalization, and Ghana during the 1990s, a large number of buyers compete without restriction to purchase seed cotton from farmers, with no single set of firms dominating. Finally, hybrid structures encompass cotton sectors that are either attempting to liberalize (e.g., Benin) or to solve unintended consequences from the liberalization process (e.g., Uganda since shortly after liberalization).

With the exception of competitive market structures, cotton is produced under some type of contract farming scheme. Previous studies showed that participation in contract farming schemes can overcome some of the constraints related to input intensification, directly through better access to input packages and indirectly through increased income (e.g., Bellemare, 2012; Strasberg, 1998). By reducing the liquidity-constraint faced by farmers in using inputs, this type of contractual arrangement can increase such use, thereby increasing production and productivity. Yet, firms participating in contract farming face challenges of asset specificity, free-riding, moral hazard, adverse selection, and non-excludability, as further explained below.

The primary motivation for ginning companies to provide inputs on credit is to increase the flow of seed cotton through their gin. Seed cotton is an asset with little or no value outside of cotton processing since it cannot be used for other purposes (a condition referred to as “asset specificity” in the economics

literature). A ginning company providing input on credit is exposed to the risk that competitors may pay higher prices to purchase seed cotton without incurring the cost of providing input credit (economists call this “free riding”), thus promoting willful contract default by farmers. This behavior by farmers is typically referred to as “moral hazard” because farmers received inputs on credit at the beginning of the cropping season knowing they should, at harvest, repay the company that provided the inputs via the sale of their cotton, but instead, avoid repayment by selling their cotton to a different company. The moral hazard problem is compounded by what is called “adverse selection”, meaning that ginning firms may make incorrect choices about which farmers to support because they cannot directly observe the probability of an individual farmer defaulting on their promises and side-selling to competitors.⁷

As a result of all these challenges, gins might ration their input credit to minimize their losses while still ensuring some enhanced flow through their gin. Finally, services such as extension that generates knowledge exhibit a degree of “non-excludability”, meaning that farmers assisted by one company can share knowledge with others not associated with that company, or these others can observe and learn from the assisted farmers. Recouping the full cost of extension services may be difficult in market-based systems, especially in competitively structured systems, and companies may limit their expenditures on such services for this reason.

3. HOW DO INSTITUTIONAL STRUCTURES DRIVE COTTON SECTOR PERFORMANCE?

Attempts to resolve problems of asset specificity, free-riding, moral hazard, adverse selection, and non-excludability are at the core of ongoing institutional design efforts in cotton sectors. The particular approaches chosen in a given sector, and the outcomes attained, are heavily influenced by the sector’s institutional structure. [Poulton et al. \(2004\)](#) showed that the diversity in these institutional structures has influenced cotton sector performance in predictable ways across East and Southern Africa (ESA). [Tschirley et al. \(2009, 2010\)](#) deepened the analysis and expanded it to include West and Central Africa (WCA). At the core of their results are several findings. First, competition and coordination are both necessary but they promote different aspects of performance. Competition tends to generate higher farm-gate cotton prices and greater cost efficiencies at the ginning level, while coordination tends to facilitate the provision of services such as input credit and extension to farmers and to improve the quality of cotton.⁸ Second, under weak institutional settings, as in Africa, there tends to exist a (strong) trade-off between competition and coordination, in part because governments are unable to develop and implement the regulatory structures needed to reduce this trade-off. Third, the balance between competition and coordination varies greatly from one sector type to another and as a result, some of them perform well and others poorly in different and fairly predictable ways. No single structure performs unambiguously best in all performance dimensions.

[Table 1](#) summarizes cotton sector-type performance across a range of dimensions (farm prices, quality of input extension and provision, yields, ginning costs, and overall competitiveness). As seen, competitively structured cotton sectors offer higher prices to farmers but provide no input credit or technical advice and do not invest in cotton quality, due to the very high risk of side-selling. All three outcomes are predictable

results of the competitive structure, which features many buyers competing on price to obtain seed cotton. As a result, average cotton yields in these systems tend to be lower than in more concentrated or regulated sectors, and prices realized on world markets for cotton lint, which reflect quality premia or discounts, tend also to be lower.

Concentrated cotton sectors more effectively promote cotton quality and provide inputs on credit and associated extension training. These structures are able to do this due to limited competition in the output market, better coordination among firms, and consequently lower risk of side-selling compared to competitive systems. Yet the input packages provided by these systems are modest compared to those in most national monopoly systems, because firms are less immune to problems of side-selling. Concentrated sectors also tend to charge farmers more for inputs and to pay them lower prices for their seed cotton.⁹

Farmers cultivating cotton in national monopoly systems, all of them currently in WCA countries (though two countries in ESA – Zambia and Zimbabwe – previous had such monopolies) have historically enjoyed the best access to inputs on credit and extension services. Average cotton yields are higher, though stagnant over the past two decades ([FAOSTAT, 2013](#)). Due to the absence of competition and the heavy regulation of the sector, prices paid to farmers can be highly variable across years, though fixed within a year. They are also affected by the political dynamics at a given point in time ([Serra, 2012](#)). For example, WCA countries paid among the lowest prices in SSA during the mid-1990s after the devaluation of the Franc CFA but among the very highest ten years later.

The developmental success of national monopoly cotton sectors has been their ability to drive the capitalization of small farm enterprises, notably through the provision of financial support for household purchases of productive equipment (e.g., traction animals and ploughs) and farm management advisory services ([Tefft, 2010](#)). This success founded on growing operational inefficiencies, sometimes linked to political influence on decision-making. These problems are also a predictable feature of monopoly systems. For instance, minimal use of subcontracting arrangements, call to tender, and auctions for input procurement by national monopolies, as in Mali, created rent-seeking opportunities and inflated operating costs ([Banque mondiale, 2002](#), as cited in [Baffes, 2004](#)). The belief that cotton gins in regulated cotton sectors face soft budget constraints, confirmed frequently by experience (e.g., [Kelly & Tschirley, 2008](#)), created disincentives to good financial performance. Cotton sectors characterized by higher levels of competition, such as Tanzania, Uganda in the first years of liberalization, and (to a lesser degree) Zimbabwe, exhibit much lower costs compared to sectors managed by monopolistic firms, such as in Mali, Mozambique, and Burkina Faso ([Tschirley et al. \(2009, 2010\)](#)).

4. LINKING COTTON INSTITUTIONAL STRUCTURES TO FOOD CROP INTENSIFICATION

This section develops a conceptual framework linking cotton institutional structures to food crop intensification. First, three classes and 11 distinct types of pathways through which cash cropping may facilitate food crop intensification are identified. These pathways build on those first discussed by [Govere and Jayne \(2003\)](#). Then, the framework from [Poulton et al. \(2004\)](#) and [Tschirley et al. \(2009, 2010\)](#), summarized above, is extended in order to develop insights on how sector type affects the probability of the pathway existing

Table 1. *Cotton sector performance*

Country	Market structure	Yields (kg/ha)	Farm prices (USD/kg)	Farmer share of FOT lint price (%)	Cotton input sourced independently (%)	Cotton input credit
Burkina Faso	Local monopoly	1088	0.33	73	Negligible	100% cotton farmers, 85% all farmers in cotton zones
Cameroon	National monopoly	1167	0.32	73	Negligible	100% cotton farmers, 90% all farmers in cotton zones
Mali	National monopoly	1030	0.32	76	Negligible	100% cotton farmers, >90% all farmers in cotton zones
Mozambique	Local monopoly	575	0.21	48	Negligible	100% cotton farmers, >80% all farmers in cotton zones
Tanzania	Competitive	556	0.28	70	50–75%	0
Zambia	Concentrated	671	0.25	55	Negligible	100% cotton farmers, 30–35% all farmers in cotton zones
Zimbabwe	Concentrated (increasingly competitive)	910	0.31	49	<60%	90–95% cotton farmers, 70–80% all farmers in cotton zones
Country	Credit repayment	Extension services		Ginning costs (USD/kg seed cotton)	Overall competitiveness (FOT cost/FOT revenue)	
Burkina Faso	95%	Provision comparable to input credit		15.83	1.05	
Cameroon	95–99%; fell to 90% 2006	Provision comparable to input credit		13.42	0.99	
Mali	95%; fell to 90% as early as 2001	Provision comparable to input credit		23.39	1.15	
Mozambique	Highly variable: 60–90%	Significantly lower than input credit		23.66	0.80	
Tanzania	NA	No private extension service		8.15	0.83	
Zambia	Typically 85–98%. Falls below 70% during periodic crises	Provision comparable to input credit		12.3	0.70	
Zimbabwe	90% Has fallen since early 2000s	Significantly lower than input credit		8.06	0.85	

Adapted from Tschirley *et al.* (2009).

and being financially sustainable. By doing this, the paper responds to calls in previous literature (Jayne *et al.*, 2004) for more research on the institutional details that determine whether a given avenue for cash crop–food crop synergies actually operates.

(a) *Direct pathways*

Direct pathways involve a company providing a service whose purpose is to benefit food crops or whose use is non-excludable, meaning that food crops can benefit without detracting from the productivity of the cash crop. These pathways include: (1) provision of inputs, (2) extension advice for food crops, (3) access to mechanization, whether animal traction or motorized, and (4) literacy training, all carried out or facilitated by the cash crop company. Input provision should have positive impacts on food crop productivity as long as the farmers use the inputs on the food crop. This is expected to be the case, since a cotton company providing inputs for food crops is certainly also providing them for the cash crop. Likewise, extension advice for food crops should contribute to enhanced productivity assuming that the information disseminated leads to the adoption, by at least some farmers, of better agricultural practices. Through improved timing of operation and better seedbed preparation, mechanization should positively affect food crop productivity. Literacy training should also enable farmers to further develop their farming and management capabilities and, thus, help them to achieve higher productivity.

Input provision and extension for food crops can be in the financial interest of a cash crop processing firm under two circumstances: if there exist sufficient complementarities in production between the cash and food crops, and if the costs can be recovered either directly or indirectly. For example, the provision of inputs for maize might attract more households to cotton or convince households to devote more land to cotton, both of which should contribute to higher volumes of cotton output being processed and lower unit processing costs.

The existence and sustainability of direct pathways depends entirely on the ability to recover costs associated with them, which depends on the ability to coordinate across firms and between firms and farmers. Systems that are good at coordination across firms will have some ability to support these pathways, while systems that are poor at such coordination will have little or no ability. The national monopolies and competitive structures generate the clearest predictions. All these direct pathways are unlikely to exist in competitive structures due to their inability to ensure cost recovery through the purchase of all cotton from a benefitting farmer. In fact, competitive cotton sectors in SSA have struggled mightily with institutional design to facilitate input and service provision just for cotton, with little if any success (Delpeuch & Vandeplas, 2013; Poulton & Maro, 2009; Tschirley *et al.*, 2009, 2010).

These direct pathways have a medium probability of existing and being sustainable under national monopolies. In contrast with competitive systems, national monopolies are more likely to recover the cost of these programs through their

cotton activities. Even if they do not, the soft budget constraint, often associated with such national monopolies, may allow the services to continue for some time. However, the positive impacts of these services on cotton will not be as large as for these same services focused on cotton, making it more difficult for the firm to recover costs. For example, if a farmer can obtain inputs for food crops (as well as for cotton) by producing cotton, then more households may choose to produce cotton. Yet the food crop inputs will have less impact than the cotton-specific inputs on cotton production and yield, and thus on the firm's ability to recover its costs. If the firm attempts to cover these costs through lower cotton prices, this may undermine the entire operation. If instead they do so through soft budget constraints, financial sustainability may also eventually be undermined. National monopolies often show generalized cost-inefficiency, which might undermine their ability over time to continue providing these services.

These direct pathways have a medium to low probability of existing and being sustainable under concentrated sectors. On the one hand, firms in a concentrated sector are more subject to side-selling and therefore, less able to recover costs than national monopolies. On the other hand, firms in a concentrated sector are less subject to side-selling and therefore, more able to recover costs than firms in a competitive system. Larger firms, more common in concentrated systems than in competitive ones, are in a better position to focus on medium-term objectives due to less competitive pressure and therefore, to provide some services to their farmers.⁹ As such, firms in concentrated systems will be more attractive to donors as vehicles for broader service delivery than will the smaller and necessarily less service-oriented firms most often found in competitive systems.

These direct pathways have the same probability of existence and being sustainable in local monopolies as in concentrated systems for three reasons. First, limited regulatory capacity in low-income economies means that local monopolies may be subject to periodic side-selling pressures just like firms in concentrated systems – the statutory monopoly is ignored by other investors, who purchase cotton that they did not support with input provision. Second, the firms in these systems tend to be more similar to those in concentrated sectors, in terms of size and service orientation, than to most of those found in competitive sectors. Finally, as pointed out by Poulton, Tschirley, and Plerhoples (2010, p. 44), firm history and culture matter in both of these systems, with larger firms (many of them multi-nationals) often having longer time horizons and being more committed to service delivery and quality than smaller (often local) firms.

(b) *Indirect household-level pathways*

Indirect household-level pathways derive from the cash cropping activity but depend to a greater degree than the direct effects on household choices and may involve some trade-off between the productivity of food and cash crops. Four indirect pathways at the household level are identified. First, households may use income from the cash crop to purchase food crop inputs or otherwise invest in food crop productivity (through purchase of animal traction). Second, households may divert inputs to food crops that were provided by the cash crop company for use on the cash crop. Third, cash cropping households may develop stronger agricultural and managerial skills through extension advice and participation in the contract farming scheme. Fourth, cash cropping households may enjoy agronomic spillovers, such as residual nutrients from fertilizer application on cotton that benefits

food crops through rotation (Dione, 1989; Pieri, 1989; Strasberg, 1998).

The existence and sustainability of these indirect pathways rests on the ability of the sectors to provide cotton services and generate income for farmers. The first pathway, purchase of food crop inputs, depends only on the reliability with which households can generate income from cotton. On the one hand, yields are expected to be higher in more coordinated sectors, such as in monopolies and concentrated, but on the other hand, input costs are expected to be higher and output prices lower than in competitive systems. Therefore, no clear prediction can be made for household incomes.

The existence and sustainability of the input diversion and strengthened skills pathways depend on the provision of input credit and extension services for cotton. The primary agronomic spillover is residual nutrients benefitting food crops through rotation and fertilizer use. The agronomic spillover pathway thus depends on access to fertilizer obtained on credit and meant for cotton, and/or purchased with cotton income.

As previously discussed, competitive systems do not provide input credit and extension services due to their inability to ensure costs recovery and to limit side-selling. As such, neither of these pathways is expected to be operational in competitive systems. In the other three sector types, input diversion does exist and undermines the cash crop scheme, since it makes it harder for gins to recoup their costs. The probability of existence and sustainability of these pathways is expected to be medium–high in national monopolies, since they have historically had the best access to input and extension services. The expectations are medium–low for local monopolies and concentrated systems, since the existence and sustainability of these indirect pathways are expected to vary across companies due to differing cultures and capabilities, and to vary over time due to periodic side-selling crises.

(c) *Indirect community-level pathways*

Indirect community-level pathways involve investments by private and public actors that may be induced by the cash cropping activity. These effects are felt by all households in an area and may influence their welfare broadly and across multiple economic activities. Three indirect pathways at the community level are identified: (1) private input supply, (2) private marketing infrastructure, and (3) public infrastructure. Induced private investment requires a sufficiently large increase in income among a sufficient number of farmers in a defined geographical area to make such investment profitable. Govereh and Jayne (2003) addressed private investment, as did Dione (1989) and Strasberg (1998). Governments may also choose to invest in dynamic cash cropping areas, hoping to increase the payoff to their spending by spurring further development in the area, again to the benefit of all economic activities. Increased public investment in public goods and services, such as rural roads, can significantly contribute to agricultural productivity growth and private investment (Economist Intelligence Unit, 2008). Along with agricultural research and education, investments in rural roads have been found to be the most effective public expenditures for promoting agricultural growth (Fan, Saurkar, & Shields, 2007).

Sectors that succeed in enlisting large shares of the rural population in cotton production and that generate solid profits for these households are expected to perform well in these pathways. In this regard, national monopolies hold a clear advantage. Over 90% of all farmers in key production zones of the WCA national monopolies produced cotton (Tschirley et al., 2009, p. 82). Until recently, public sector investment

Table 2. *Cash crop–food crop pathways*

Pathway	Cash crop sector type			
	National monopoly	Local monopoly	Concentrated	Competitive
Direct				
Input provision for food crops	Medium	Medium to low	Medium to low	Unlikely to exist
Extension advice on food crops	(but undermined by general	(depends largely	(depends largely	
Mechanization promotion	inefficiency of the model)	on outside funding)	on outside funding)	
Literacy training				
Indirect, household level				
Higher cash income used for food crops	No clear prediction	No clear prediction	No clear prediction	No clear prediction
Input diversion to food crops	Medium (undermines	Low (undermines	Low (undermines	Unlikely to exist
	cash crop scheme)	cash crop scheme)	cash crop scheme)	
Stronger agricultural and managerial skills	High	Medium	Medium	Unlikely to exist
Agronomic spillovers	High	Medium	Medium	Unlikely to exist
Indirect, community level				
Private input supply	High	Medium	Medium	No clear prediction
Private marketing infrastructure	High	Medium	Medium	No clear prediction
Public infrastructure	High	Low	Low	Low

linked to cotton was more evident in the WCA national monopolies, many of which received mandates to build broader rural development strategies, including road networks, around cotton.

Local monopolies may also perform well in this regard. For example, in Mozambique the government requires, in exchange for the monopsony right that companies receive to purchase seed cotton, that they provide extension and input assistance for cotton to all interested farmers in their area, and furthermore that they support food crop production, though in unspecified ways. Farmer participation in cotton in Mozambique's so-called "concession" areas typically exceeds 80%, and participation in Burkina Faso is higher than that (Gergely, 2009). In Ivory Coast, the gin company, Ivoire Coton, works with about 90% of farmers in its concession area (Peltzer & Rottger, 2013).

Among concentrated sectors, a smaller share of the rural population cultivates cotton. For instance, Zimbabwe sees 70–80% of farmers in key production zones cultivating cotton, while this percentage rises only to 30–35% in Zambia (Tschirley & Kabwe, 2006). A vast majority of households grow cotton in the major cotton-producing zones of Tanzania, especially in years when sentiment toward cotton is positive

(Poulton & Maro, 2009). This broad participation is primarily attributed to positive agro-ecology and suggests that it would not be replicated under this sector type in less productive areas such as the Sahel. The framework and the expectations are summarized in Table 2.

5. COUNTRY EXPERIENCE

This section draws on the literature to review country experience and assess whether available evidence supports the expectations that have been developed in the conceptual framework. Table 3 shows the countries for which evidence is presented on each sector type.

(a) *National monopolies*

The conceptual framework suggests that this structure has at least a medium probability (higher than for any other structure) of supporting direct pathways for food crops and medium–high probabilities of supporting most indirect pathways at household and community levels. Review of the evidence suggests that this structure makes it possible to support direct

Table 3. *Country cases*

Sector type	Country cases
National monopolies	Mali (CMDT) for many decades and continuing through late 2000s Cameroon (SODECOTON) for many decades and continuing through late 2000s Zimbabwe prior to reforms of mid-1990s Zambia (LINTCO) prior to reforms of mid-1990s
Local monopolies	Mozambique (PLEXUS, formerly Lonrho) since relaunching of cotton in mid-1980s through to current time Burkina Faso (SOFITEX and Faso Coton) since 1998 Ivory Coast (Ivoire Coton) into mid-2000s
Concentrated	Zambia (Dunavant, Cargill) from mid-1990s to present day Zimbabwe (Cottco) from mid-1990s to present day
Competitive	Tanzania from mid-1990s to present day Uganda during 2–3 years immediately after reforms of the 1990s Ghana for 15 years after reforms in mid-1980s Malawi to present day

Note: Names of cotton gin companies that are cited in this paper are provided in parentheses.

pathways but that such assistance has not always been pursued, especially in ESA. As expected, most indirect pathways have been supported.

(i) *National monopolies in West and Central Africa*

Research provides strong evidence of direct pathways in the national monopolies of WCA, especially in Mali and Cameroon where cotton served as a vehicle for rural development. In Mali, the gin company, CMDT, upon nationalization of the cotton sector received a broad mandate for an integrated rural development program explicitly focusing on cotton and cereals through the provision of applied research, extension services, and credit. The CMDT financially supported agronomic research programs on food crops conducted by local research institutes (Coulibaly, 2005). The promotion of early maturing, disease-resistant maize varieties by CMDT and their adoption by farmers in the CMDT southern region led to important increases in maize production (Tefft, 2010). CMDT also worked to develop market outlets for food crops, notably via the maize development project (Dione, 1989).

The national monopoly in Cameroon, SODECOTON, received a similar mandate. It has supported extension for food crops, has shared joint responsibility with another agency for animal advisory services, and has implemented soil fertility management programs whose benefits were not limited to cotton. Moreover, animal manure, produced in larger volume due to assistance for animal husbandry, is said to be applied in roughly equal proportions to cotton, maize, and sorghum. SODECOTON also provides input credit, though only partial, for food crop inputs along with cotton, and investment credits (Peltzer & Rottger, 2013).¹⁰ Gergely (2009) argued that SODECOTON has had strong spillover effects on food crops through notably the dissemination of new cropping techniques, the promotion of production, and use of organic manure, and the provision of literacy.

Historically, the national monopoly in Mali has also been extensively involved in agricultural mechanization, notably through the support of animal traction to increase productivity. In the early 1970s, programs were created to train blacksmiths to make and repair farming equipment (Campbell, Belem, & Coulibaly, 2007). To overcome farmers' liquidity constraints, credit and subsidy programs were also offered, along with training and information on how to improve farming techniques, to make organic fertilizer, and build stockyards. As a result, the share of cotton farmers using animal traction rose from low levels to 85% by the end of the 1980s. Compared to the national average, regions producing cash crops, in particular cotton, have higher rates of mechanized farms and higher farm incomes (Republique du Mali, 2005). In non-cotton regions, difficulties in accessing equipment and credit have limited farm mechanization. The cotton ginning company also provided literacy lessons as part of its rural development campaign.¹¹ The investment credits that SODECOTON in Cameroon provides to its growers are also likely to be used at least in part for agricultural mechanization that benefits all crops.

The use of cotton earnings for intensifying food crops depends on strong income generation from cotton. In Mali, cotton farms are more food secure than non-cotton farms and have the advantage of not being forced to sell their cereal surplus at the harvest, when prices are low, in order to meet their liquidity constraint (Fok & Tazi, 2004). Likewise, Dione (1989) found that coarse grain production of farmers in CMDT regions was more likely than in other regions to exceed their annual consumption requirements. In the 1980s, farmers from the CMDT regions benefited from better access

to inputs on credit for both food and cotton crops through the cotton interlinked scheme. With the ongoing market-oriented reforms in Mali, non-cotton farmers have lost access to the interlinked credit-input-cotton scheme and have to rely on the private market to obtain inputs and credit. Cotton growers have also to rely on the private market to purchase inputs for cereal crops. Weak private input and credit markets, however (Theriault, Serra, & Sterns, 2013), mean that any contribution that cotton makes to food crops is now primarily driven by input diversion from cotton to cereal fields, fertilizer residue from crop rotations, and application of organic manure.

In Mali, the private input supply pathway has had a limited impact on food crop intensification. As for other SSA countries, the disappearance of state-controlled enterprises distributing inputs in the 1980s did not lead to improved agricultural credit and input distribution, especially outside the cotton sector, since neither the public sector nor the private sector took over the functions (Dione, 1989). Decades later, Theriault and Serra (2014) speaks of continued weakness in private input markets, including in cotton-growing areas. These findings tend to undercut the expectation that such monopolies, by driving strong income growth for large shares of the population in cotton-growing areas, will promote strong investment from the private sector. It also raises the question of whether poor performance of private input markets in these areas is due to the national monopoly *per se*, or to the fact that the national monopoly chose to supply food crop inputs directly (one of the direct pathways) rather than working with the private sector to accomplish this. It may also be the case that the income generation from cotton has to be sufficiently high over a sufficiently long period to boost the effective demand for agricultural inputs and thus, to attract private investment

Other indirect community-level pathways have been very active in Mali. Cotton producers' cooperatives are financially compensated by CMDT for the cotton marketing services they provide (e.g., weighing and grading). These funds are used on collective development projects to improve living conditions in rural villages. The construction of water wells, medical dispensaries, and schools are all examples of investments made possible through these funds (Theriault & Sterns, 2012). In contrast, non-cotton villages have to support collective projects through village-level tax revenues only. Moreover, the CMDT has invested in road construction and maintenance to connect cotton villages to gins. Improved market access has been beneficial to all smallholder farmers, notably for those with marketable cereal surpluses. All of these can be considered examples of public sector investment linked to cotton that generate broader benefits.

(ii) *National monopolies in East and Southern Africa*

In pre-reform Zambia and Zimbabwe, there is no evidence of direct support for food crops by the cotton parastatals. Neither Chiwele, Muyatwa, and Kalinda (1998, p. 23) nor Jha and Hojjati (1993), two of the few available studies of pre-reform cotton in Zambia, reported any support to food crops. Neither Poulton and Maro (2009) nor Akiyama, Baffes, Larson, and Varangis (2001) discussed any evidence of direct support in Zimbabwe. The difference in behavior between national monopolies in WCA and ESA is attributed to the maize-centric nature of the agricultural economies in ESA and the resulting existence of large programs (with specialized institutions) to directly support maize production. These institutions – the Grain Marketing Board in Zimbabwe and various programs in Zambia – provided subsidized seed and fertilizer directly for maize without using cotton as the vehicle. This strong maize orientation may be at least partially explained

by agro-ecological and agronomic factors. Unlike most of the Sahel, much of Zambia and important portions of Zimbabwe are well-adapted to maize production and, therefore, cotton has not been seen as a necessary vehicle for promoting intensification of maize and other food crops. In the Sahel, more drought-resistant cotton may have provided a more secure basis for promotion of food crops. Support for the idea comes from the fact that maize is far more dominant in diets in ESA than it is in WCA, and is more responsive to fertilizer than millet and sorghum (Kelly, 2006), which are more commonly grown in WCA. Both these facts make large-scale fertilizer and seed programs for maize more politically attractive and more likely to generate positive payoffs in ESA.¹²

Evidence is strong that Zimbabwe's pre-reform sector supported indirect pathways at household and community levels. Evidence is less strong in Zambia, where the number of cotton farmers prior to reform was never high. In the last several years of the pre-liberalization period, a large number of Zambian farmers moved out of cotton due to low prices (Chiwele *et al.*, 1998, p. 23). Despite the fact that nitrogen was the major deficient nutrient and that the use of fertilizer would have had positive impact on production and profits, the cotton parastatal, LINTCO, did not include fertilizer in their input package for cotton (Jha & Hojjati, 1993). Given Zambia's history of farm-level default on fertilizer credit, and LINTCO's lesser state support compared to the various maize promotion agencies, this decision is understandable.

In pre-reform Zimbabwe, the expansion of the cotton sector and the development of more marginal land are integrally linked (Abbot, 1987), suggesting a broader development role for cotton during the national monopoly days. At Independence, the broad thrust of agricultural policy was to extend service support from commercial farming areas into communal areas, where most smallholders live (Poulton & Hanyani-Mlambo, 2009, p. 8). The number of cotton collecting sites in communal areas tripled from 1980 to 1985, helping (along with attractive prices and credit programs) to drive large increases in cotton production.

Together, this evidence suggests that cotton production helped spur maize production growth through indirect household-level pathways (certainly higher cash income) and indirect community-level pathways driven by public sector, all as part of a rural development package. However, the cotton parastatal in ESA focused on cotton and left maize and other food crop promotion to other institutions.

(b) *Local monopolies*

The evidence base on local monopolies is thinner because the model is not very common and relatively new. Mozambique has the longest-standing structure of this type and has been studied with some intensity. Ivory Coast is next in line, with a local monopoly system replacing the national monopoly in 2001 and lasting until very recently. Burkina Faso's experience is the shortest and may be potentially misleading, since the former parastatal, SOFITEX, never had less than an 85% market share following re-structuring into three local monopolies (SOFITEX, Faso Coton, and SONOMA).

Available evidence shows that these sectors in all three countries have supported direct pathways at different times. For instance, the dominant local gin in Burkina Faso, SOFITEX, provides farmers with inputs on credit for cotton and maize at the start of the planting season, recouping their costs from cotton payment after the harvest. Given that a large majority of Burkinabe producers grow coarse grains along with cotton, in part for their own consumption, provision of inputs for both

crops is aimed at limiting input diversion from cotton and ensuring higher cotton productivity (Theriault & Serra, 2014). SOFITEX has also provided farm management advisory services based on a holistic approach of cropping patterns (Gergely, 2009), which clearly suggests that the company supported direct extension on food crops. Through the Cotton Made in Africa (CMiA¹³) Initiative, some local gins in Burkina Faso (Faso Coton), Ivory Coast (Ivoire Coton), and Mozambique (Plexus) organize training programs on cultivation technique for cotton and food crops, natural resource management, and animal husbandry to cotton farmers within their delimited geographical zone. In addition to this training, literacy lessons are offered to Burkinabe cotton farmers through the CMiA initiative. Kaminski and Serra (2011), however, documented unstable performance in Burkina Faso since reform, and tied this to changing institutional details within the sector, as well as to outside forces.

Peltzer and Rottger (2013, p. 11) rated the provision of what they call "investment credit" of Faso Coton in Burkina Faso and Ivoire Coton in Ivory Coast as good and very good, respectively, while noting that Ivoire Coton provides inputs beyond what are needed for farmers' cotton crop. Demont and Stessens (2009) showed how Ivoire Coton facilitated access to animal traction, with very positive effect for farmers. In Mozambique, Strasberg (1998) showed that one firm among the four that were studied provided seed and fertilizer for maize and purchased the maize. But this practice was based on strong demand from donors for maize for food aid and as the need for food aid declined after the end of the civil war, the company (Lonrho) abandoned the practice. Since then, there is no evidence of any such practices among any companies in Mozambique. Still, it is quite unlikely that this company would have provided this service in a competitively structured system. Overall, the evidence shows that local monopolies can support direct pathways, but that actual practice depends on history, opportunities for public-private partnership, and particular circumstances that make such an approach attractive.

As said before, the existence and sustainability of indirect household-level pathways depend on income generated from cotton and/or on the sustainability of service provision for cotton. In regard to income, Tschirley *et al.* (2009) showed that Burkina Faso and Mozambique delivered very different results: with past performance (as a national monopoly) in input provision and mechanization leading to strong farmer returns in Burkina and absence of the same, combined with very low prices, leading to the lowest returns of any country in Mozambique. Peltzer and Rottger (2013) showed similar variability: Faso Coton in Burkina had the lowest net return on cotton among all six of their studied countries in 2007–08 and 2008–09, but the highest in 2011–12, Ivoire Coton consistently ranked among the top among their countries and Plexus in Mozambique consistently ranked among the lowest.¹⁴

Cotton service provision (the driver of indirect household pathways) is also variable within the local monopoly system. Tschirley *et al.* (2009) showed that Mozambique's provision was far inferior to that of Burkina Faso. Likewise, Peltzer and Rottger (2013) rated cotton input provision by Faso Coton in Burkina Faso and Ivoire Coton in Ivory Coast as "very good", while Plexus in Mozambique was rated only as "good." It is worth noting that Plexus is the successor to Lonrho, which Strasberg (1998) and Tschirley *et al.* (2009) both showed to perform the best among all Mozambican companies in cotton input provision. This pattern seems to continue today, with most other companies in the country providing inferior cotton input supply compared to that of Plexus.

The empirical record on the indirect community-level pathways for local monopolies is not as robust. One general observation is that local monopoly systems have typically emerged by moving away from a national monopoly.¹⁵ Such a move is typically accompanied by efforts to reduce expenses in the cotton sector, notably by delinking broader rural development objectives from cotton promotion. It is thus reasonable to expect that public infrastructural investment in cotton areas would be less strong in local monopolies than in national monopolies. There is no evidence in Mozambique of private sector investing more heavily in cotton areas than in other productive areas of the country. Private sector investment in general has remained exceptionally low until very recently. Given that Burkina Faso was for so long under a national monopoly, it is difficult to attribute any private sector investment to the local monopoly model. Although Ivory Coast provides a longer time frame for analysis, we are not aware of any studies that address this issue.

(c) *Concentrated systems*

The best examples of direct pathways in concentrated systems is when development partners work with leading companies to deliver services to farmers through these companies' extension and input distribution networks. Through the CMiA Initiative, Cargill and Dunavant in Zambia provide training to cotton farmers, notably on pest management and natural resource protection and conservation. In partnership with the World Food Programme's Purchase for Progress, Dunavant in Zambia is also providing support to cotton farmers in acquiring mechanized equipment, such as tillage equipment and tractors. In regard to Zimbabwe, Cottco (the leading private firm in Zimbabwe since reform) collaborated with CARE International and other partners, to promote improved establishment of a range of crops in semi-arid areas (DfID, 2005).

Cotton ginning companies that also process oil may enjoy complementarities between cotton and soybean cultivation. With soybean production skyrocketing in southern Africa due to rapid growth in demand for poultry, both Cargill and Dunavant in Zambia are said to be in the experimental phase of jointly promoting the two crops (Peltzer & Rottger, 2013). This may be a special case for two related reasons. First, soybeans are not a traditional food crop for African smallholders and require more complex processing than do most cereals to be consumable; they are best considered a cash crop in this region. Second, the number of buyers for soybeans is relatively small, reducing somewhat the risk of side-selling that a ginneries faces in providing some support for it.

Broad evidence of indirect effects at household and community levels in the Gokwe area of Zimbabwe are provided by Govereh and Jayne (2003), though they did not identify exactly what these pathways were. Their analysis simply showed higher maize yields associated with cotton growing and with the number of cotton input traders in the village. They interpreted these results as an indicator of community-level indirect pathways supported by cotton. This interpretation is supported by Poulton and Hanyani-Mlambo (2009, p. 35) who found that while economic hardship in 2006–07 made it difficult for farmers to purchase inputs and led to the shutdown of many input suppliers, cotton companies during that time provided more support to producers than ever before. Because this support included fertilizer among other inputs, and because maize is produced in rotation with cotton in Zimbabwe, it stands to reason that at least the indirect household-level pathways were functioning.

These same authors also noted, on the basis of focus group interviews, that some fertilizer meant for cotton was being diverted to maize in agro-ecologically marginal areas, where most households were deficit in grains and wished to reduce their need for maize purchases. But, in keeping with the maize-centric policy noted earlier, these authors also mentioned that subsidized fertilizer meant for maize and distributed by the Grain Marketing Board, got diverted to cotton in more agro-ecologically favorable zones, while cotton fertilizer did not get diverted to maize in these zones. This tells a similar story to the Sahel, where fertilizer provided for cotton gets diverted to maize.

The pattern of agricultural development in Zambia has been massively influenced by the country's focus on subsidized maize purchase and distribution of subsidized maize seed and fertilizer for use on maize. These subsidies were reduced after economic reform began in 1994. Yet, they were never eliminated and have grown again to very high levels over the past eight years. The ability of cotton to support private sector indirect pathways at community level under these circumstances is very limited. Mason and Ricker-Gilbert (2012) and Mason and Jayne (2012) provided broad evidence of the negative effect of these programs on private sector input provision. The former estimated that 1 kg of subsidized maize seed distributed by the government in the late 2000s reduced private maize seed sales by 0.49 kg, while the latter found that each 1 kg of subsidized fertilizer reduced private fertilizer demand by 0.13 kg.

(d) *Competitive systems*

The empirical record shows clearly that direct pathways are not supported by competitively structured cotton sectors and that service provision for cotton, which the indirect pathways of input diversion, agricultural skills, and agronomic spillovers depend on, has also not been sustainable. Peltzer and Rottger (2013) noted that cotton firms in Malawi have no contractual relationships with their farmers, due to promotion of intense competition by the government. Poulton *et al.* (2004) and Goreux and Macrae (2002) reviewed Ghana's experience after reform, which led to a competitive structure in 1985. By 1995, the leading company began providing input credit, with some smaller companies following shortly thereafter. However, rampant side-selling, quickly brought such input credit to a halt. This latter set of patterns is fully consistent with the framework. Tschirley *et al.* (2009, pp. 76–77) documented the repeated and unsuccessful struggles that Tanzania and Uganda had in trying to provide input credit and extension in unregulated and competitively structured systems. Similar struggles were recently documented in Malawi (Peltzer & Rottger, 2013, p. 27).

Evidence is uneven regarding the level of profits earned from cotton in competitive systems, which drives the indirect pathway of inputs purchased with cotton income. Tschirley *et al.* (2009) showed Tanzania to generate low returns among the nine countries they studied. In their comparative study, Peltzer and Rottger (2013) reported cotton farmers in Malawi to earn among the highest returns to cotton, but to have the lowest total per capita household income, in terms of purchasing power parity, of all six countries they studied. The collapse of Ghana's cotton sector under the competitive structure also suggests that it was not able to sustainably maintain strong returns to farmers. The agricultural skill pathway is also less operational in these systems because it depends on farmers' independent learning, given that these systems provide no

Table 4. *Summary of expected and realized performance*

Pathway	Expected performance	Realized performance	Does evidence concur with expectations?	Adequacy of evidence base & other comments
Direct				
Input provision for food crops Extension advice on food crops Mechanization promotion Literacy training	Strongest for national monopolies, absent for competitive, medium-to-low for local monopolies and concentrated	Variable for national and local monopolies: pathways frequently but not always supported. Positive (but limited evidence) for concentrated sectors. Entirely absent in competitive	Largely yes, though stronger evidence than expected for existence in local monopolies	Strong for national monopolies and competitive; medium for local monopolies (and often complicated by recent move out of national monopolies). Limited for concentrated
Indirect, household level				
Higher cash income used for food crops				Income: strong for national monopolies, relatively weak in other sector types.
Input diversion to food crops Stronger agricultural and managerial skills Agronomic spillovers	No clear prediction for income in any type. For the other pathways, best in national monopolies, lower in local monopolies and concentrated, absent in competitive	All four pathways strong in national monopolies. Variable in local monopolies. Inconclusive in concentrated. Absent in competitive	NA for income Yes for the three others	For the three others: Strong for national monopolies and competitive. Less so in concentrated (confounding effect of maize policies in Zambia) and local monopolies
Indirect, community level				
Private input supply Private marketing infrastructure Public infrastructure	Strong in national monopolies, medium-to-low in local monopolies and concentrated, absent in competitive	Infrastructure: strong in national monopolies, input supply weak. Variable in local monopolies and concentrated. No evidence in competitive	Yes for infrastructure in national and local monopolies and concentrated. No for input supply in national monopolies Not clear for competitive	Strong evidence base for national monopolies. No evidence in competitive (does this indicate absence?). Weak for local monopolies

extension assistance for cotton. There is no study of indirect community-level pathways in competitive systems.

6. CONCLUDING COMMENTS

Table 4 summarizes expected performance of cotton sector types on the 11 pathways, compares this to the empirical evidence assembled from 13 country cases, and assesses the adequacy of the evidence base. For national monopolies and competitive sectors, where theoretical predictions were clearest, the evidence base tends to be strong and in agreement with predictions. Interpreting the absence of any evidence regarding indirect community-level pathways in competitive sectors is difficult. Does the absence indicate that these pathways do not exist or that the question has simply not been investigated? In local monopolies and concentrated sectors, evidence supports the general expectation of more variable effects on food crop intensification in these sectors than in national monopolies.

Five results stand out. First, the evidence suggests that competitively structured cotton sectors sharply limit the ability of the crop to contribute to food crop intensification. This finding provides another argument for avoiding reflexive recommendations to liberalize such sectors. Instead, and as argued by Poulton *et al.* (2010), feasible reform paths need to take into account the country's previous experience in order to avoid wide divergence between what a structure could theoretically deliver if properly implemented, and what it actually does deliver.

Second, historical evidence suggests that the ability of cotton to spur food crop intensification has been the strongest in WCA national monopolies. In the past, some WCA national monopolies had mandates to promote rural development. Cotton revenues were therefore used for the construction and maintenance of road networks, provision of food crop inputs, and extension along with other services. In contrast, there is little evidence of spillover investment in ESA national monopolies, where cotton was not seen by the state as the vehicle for rural development and therefore did not receive the same mandate as their counterparts in WCA. With market-oriented reforms, most of the mandates in WCA have now disappeared. This raises questions as to whether WCA

national monopolies will remain more likely than regional monopolies to provide such support and if so, under what incentive regime.

Third, evidence shows that private input markets are underdeveloped in cotton areas of WCA and that the provision of inputs by cotton parastatals has likely contributed to this situation. There is a parallel between this dynamic in WCA and the demonstrated displacement of private input dealers in ESA from maize input subsidy programs in that region, entirely unrelated to cotton. This finding shows the complexity of developing a sustainable private sector input system while ensuring broad access for smallholder farmers.

Fourth, the variable performance of local monopolies and concentrated sectors suggests strongly that the institutional details in these systems matter greatly to performance. Without attention to these details, policy makers cannot confidently predict the performance of these systems on cotton, much less on the promotion of food crop intensification.

Finally, private-public-civil society partnerships to foster productivity for both cash and food crops are of particular interest in local monopolies and concentrated sectors, for three reasons. First, some firms operating in these systems tend to be attractive to development partners as vehicles for service delivery due to their typically large size and longer time horizon on investment. It is noteworthy that of the six countries in which CmiA has been active, four have concentrated or local monopoly structures and the only sector they classify as competitive nonetheless has a leading firm with the resources and orientation that allowed them to work with it. Such partnerships may be more likely in these systems than in national monopolies, where political economy factors may create risks in such collaboration, or in competitive sectors, where the typically smaller size and shorter planning horizon of firms does not favor such partnerships. Second, the variable performance of local monopolies and concentrated systems means that such partnerships are frequently needed to ensure desired performance. Finally, such partnerships can enhance positive spillovers to food crops with no cost to the public treasury nor indirect cost to farmers because they mobilize outside funds to support the effort.

Additional research should go beyond demonstration of the existence of pathways to show in more quantitative fashion the impact of those pathways on food crop productivity.

NOTES

1. Writers such as Collier and Dercon (2009) and Ellis (2005) primarily question the feasibility of achieving such growth, not the desirability of such growth *per se*. The cost and logistical complexity of achieving it is at the core of their critique.

2. See Morris, Kelly, Kopicki, and Byerlee (2007) for more detail on the characteristics of "market-smart" input subsidy programs.

3. For the broadest current program (Cotton made in Africa – CMiA), see Peltzer and Rottger (2013). Strasberg (1998) documents Lonrho's promotion of maize production in Mozambique in the 1990s. Many West African governments used cotton as a vehicle for rural development (e.g., Mali and Cameroon).

4. Other cash crops, such as cacao, coffee, tea, and sometimes sugar cane are also produced mainly by smallholder farmers under different kinds of contract farming schemes. Chapoto (2013) examined the effect of cacao on maize production, while Jayne, Yamano, and Nyoro

(2004) investigated the synergy between interlinked input-credit schemes in cash cropping (tea, coffee, and sugarcane) and fertilizer use on cereals.

5. Jayne *et al.* (2004) called for more research to help identify the institutional details of (sustainable and) workable strategic partnerships between cash crop firms, outgrower farmers, and government. Several authors explored the impacts of particular institutional setups, but none in a comparative framework.

6. Peltzer and Rottger (2013) classified Ivory Coast as a concentrated sector and not as a local monopoly. Here it is put in the latter category because at the time of their study it had only very recently moved to a concentrated set-up and Ivoire Coton was still the dominant firm, suggesting that performance at that time may have been driven more by the recent past (under which the local monopoly system lasted about ten years) than by the current set-up. Note also that at the time of the Peltzer and Rottger (2013) study the country was already considering returning to a local monopoly setup.

7. Side-selling: A situation in which farmers are selling to a firm other than the firm from which they received input credit. Typically side-selling is done with the purpose of avoiding loan repayment.
8. Cotton quality refers to the color, cleanliness, grade, strength, and length of the fiber. High-end markets are willing to pay premium prices for cotton fibers that are white, bright, clean, fine, strong, and long.
9. For example, 30–40 firms in Tanzania compete for cotton each year, and none of them consistently hold more than 15% of the market. Uganda also had a large number of small firms when it had a competitive structure.
10. Peltzer and Rottger (2013) did not define nor give specific examples of what these investment credits were, but by their nature can be considered of a kind with D3, promotion of mechanization.
11. With the promotion of market reforms, the CMDT has refocused its activities toward cotton and has gradually withdrawn from broader input supply activities, promotion of mechanization, and literacy training.
12. Though the voluminous literature, some cited earlier in this paper, suggests that the programs, as designed and run, often have not generated positive overall returns.
13. The overall goal of CMiA is to improve the conditions of life of cotton farmers through increased trade and alliance with ginning and retailing companies.
14. A limitation in Peltzer and Rottger (2013)'s study is that they focused on particular companies in each country, rather than sampling across all companies.
15. Though different in many ways from those seen in WCA, pre-reform Mozambique maintained key national monopoly powers over its cotton sector.

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