

From Land Grab to Land Development: The Past and Potential of Private Investment in Frontier Agriculture

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Paper prepared for the Festschrift in honor of Hans Binswanger-Mkhize,
edited by Prabhu Pingali and Gershon Feder (forthcoming, Routledge 2017)

July 2016

Abstract

Private investments in land improvement can sharply increase the productivity of farming and accelerate local economic development. The provision of new irrigation and drainage systems, land clearing and levelling, roads and other infrastructure often has economies of scale beyond the reach of family farmers and beyond the capacity of governments. This paper surveys over 15 historical and on-going examples of private investments in frontier land development across Asia, the Americas and Africa, finding that the most successful cases involved investors who aimed to subdivide and sell parcels for individual family farms. The state generally played an important regulatory role, providing some public goods and making land concessions conditional on rapid transition to family farming. The on-going operation of large farms by the investors has generally succeeded only in specific circumstances, typically around scale economies in agro-processing. The land development model has much potential in Africa to improve productivity and avoiding charges of land grabs, but innovation public-private partnerships are needed to overcome high transactions costs.

Keywords

Land development, agribusiness investment, agricultural history, large-scale farms

Introduction

Hans Binswanger's work on agrarian relations offers deep insights into the nexus of agrarian structures, property rights and farm investment. Because agriculture is dominated by family farmers whose capital accumulation comes primarily from retained earnings, financing of capital investments to improve the productivity of farms is an enduring challenge in economic development. In poor countries, farm families typically have much lower levels of capital and earnings per worker than nonfarm enterprises, and external investors remain deterred by the difficulty of managing risks, the seasonality of agriculture, transactions costs, information asymmetry and location-specific management knowledge that make family farming the dominant form of production around the world.

Binswanger and Rozensweig (1986) in *Behavioural and material determinants of production relations in agriculture* have noted conditions that may sometimes favour highly capitalized larger farm operations—notably the so-called “classic plantation crops” with scale economies in processing or transport that must take place immediately after harvest (tea, sugarcane, oil palm, bananas). Even for these crops, institutional innovations often facilitated by the state such as contracts and collective action have, over time, converted most plantation production to family farming (Byerlee, 2014).

Binswanger et al. (1993) in *Power, Distortions, Revolt, and Reform in Agricultural Land Relations*, conclude that political economy and policy biases rather than inherent economies of scale have historically been the major drivers of the emergence of large-scale farms.

Over the 21st century it is possible that new technologies from ‘big data’ farming may automate field operations and allow precise field and seasonal management that will allow outside investors and their managers to compete with family farmers. Complying with demanding food safety and sustainability standards is another development that may favour large farms that are vertically integrated with downstream operations (Deininger and Byerlee, 2012). These changes could provide new conditions in which company farms become cost-effective, but as of today crop production remains overwhelmingly in the hands of family farmers, even in the most highly automated precision-farming systems of industrialized countries, reflecting their inherent efficiency advantages (Lipton, this volume).

This paper explores an overlooked role of large investments to finance investments in land development to improve agricultural productivity, in settings where investors could be repaid with funds earned by renting or selling parcels for family farming once the land is developed. Recent analyses of outside investments in farmland have emphasized motivations ranging from food security in the investor's origin country, to commodity booms that have inflated investors' expectations, to land speculation in the face of growing land scarcity. Regardless of investor motivation the literature has overwhelmingly noted the limited benefits from investor-owned farms to local communities in relation to the high costs borne by those communities, such as land conflicts, loss of grazing and water resources, and tensions from immigrant labor. The

idea that companies could invest in land development without necessarily operating the resulting farms offers potential long-term benefits for both investors and communities alike.

We define land development as start-up investment that sufficiently increases the productive potential of land to justify the entry of new farms that transform local farming systems. Notable examples are irrigation and drainage systems, soil amendments, and transportation services and other basic infrastructure that convert low value areas into productive farmland. Such improvements can be undertaken by self-employed family farmers, sometimes with the help of contract operators, but in frontier areas there are few farmers that have the requisite skills and access to capital.

Land development efforts in frontier areas often involve significant economies of scale and specialized knowledge that favor large-scale external investors. But operating the resulting farm is not necessarily the most effective way for them to recoup their investment. Historically, most company-owned large farms introduced during periods of land development have eventually given way to family farms that are more efficient in the operating stage, after the land has been developed. The investor's objective has been to invest in land development as such, and then sell or pre-finance sales of the land for family farmers to cultivate.

Historically too, the costs of land development have often been highly subsidized by state programs but such programs have fallen out of favor due to cost overruns, frequent failures and scarcity of resources for public investment (Kinsey and Binswanger, 1993). Yet there have been good examples of private companies assuming these costs both in today's high-income countries (e.g. land development in Australia's Ninety Mile Desert) and in tropical areas (e.g. land development companies in Brazil). A closer review of today's investments suggests that some could follow a similar model such as some recent irrigation projects in Africa.

Our review will extend the standard economic framework for understanding drivers of investor-owned large-scale farms, noting the conditions under which private companies may find it profitable to invest in land development in ways that enhance economic and social welfare. The framework will also note the conditions under which such companies would find it profitable to continue farming after the initial development costs versus subdividing and selling or renting the improved farmland to smaller family-operated farms, or to outgrowers around a nucleus farm retained by the company. We then review the success or otherwise of private initiatives in land development from a historical perspective. In these cases, a variety of policy incentives were used to attract investors to develop land that governments or individual farmers had not previously had sufficient means or capabilities to do so. In nearly all of these cases, the end result was an agrarian structure based on family farms, often facilitated by pro-active state policies.

Building on history, we then review contemporary examples of private investment in land development in Latin America and Africa. Many of these may follow the historical example of breaking up into family farms but much depends on a conducive policy environment for smallholders. Together with the historical experience, our findings allow us to draw lessons (good and bad) for today's investors and governments in Africa. Since

investment in land development can often greatly increase productivity, such investments can be transformative as our historical review demonstrates.

We conclude that conceptually separating the land development phase from the operational phase opens a space for private investors that has not been sufficiently recognized to date. This allows us to outline promising policy options that on the one hand provide incentives for investment in the land development phase while on the other hand, opening opportunities to in situ smallholders or immigrant settlers to take on the subsequent farming operations.

The roles of private investors in land development

Land development investments may be of several types.

A first and most obvious land development activity is investment that changes the intrinsic physical productivity of the land itself through irrigation and drainage, land clearing and levelling, or soil amendments such as liming. Some of these investments involve specialized machinery and knowledge with significant economies of scale. For settled areas, in situ farmers can sometimes obtain these services through contracts with custom operators and service providers or cooperatives. Our focus is on frontier areas, where such investments can create entirely new farming opportunities which, once developed, can attract additional farmers and workers to expand production.

Beyond physical assets, another type of investment focuses on institutional capital that improves the value of land by providing secure title, access to capital and markets for inputs or products, and compliance with government regulations or private standards. Establishing these institutional arrangements in areas newly opened to intensive agriculture involves substantial transactions costs and specialized knowledge of surveying, land administration systems, obtaining environmental permits and so forth. In frontier areas with poorly demarcated land rights, the main challenge may be political legitimacy, attending to complex and sometimes conflicting rights in pursuit of more favorable environmental and social outcomes. Setting up new land-use arrangements has high skill requirements, large fixed costs and risks that may give specialized companies an advantage in the start-up phase, even as the marginal cost of replicating those arrangements falls over time for new entrants.

A third type of investment may not alter land quality per se but provide fixed assets attached to the land thereby enhancing land productivity. Investments in rural roads and transport logistics are important for bulky products such as grains in remote areas and oil palm and sugarcane to access mills. And if farm families and workers are to move into a new area, additional investments and organization of schools, health clinics and other services are needed.

Finally substantial investments and capacity to bear risks may be needed to adapt and experiment in order to bring new crops in new areas to a profitable stage of operation. Large companies with experience in the same industry in a similar environment elsewhere and established relationships with suppliers and customers may have a natural comparative advantage in assuming these pioneering risks. In some cases, companies' ability to bear the risks of land development may come from having a diversified portfolio of assets, including diverse kinds of land in various locations.

Such high up-front costs of land development in a risky industry like agriculture especially in frontier areas provide an advantage to investing companies with access to national or global risk capital. For example, in Sumatra, Indonesia it may be possible to purchase unimproved land suited for oil palm for less than \$1,000 per ha but at least another \$9,000 per ha is required to clear the land, install roads and drainage, obtain required permits, plant the trees, care for the plantation until the first harvest, and install the mill (Byerlee et al., 2017). Likewise in the Cerrado, Brazil, it is reported that unimproved land can be purchased for around \$1,000/ha but another \$2,000-\$4,000/ha will be needed to convert it into productive farmland (Byerlee, et al., 2017). States may offer guarantees or pick up part of the costs, especially when the improvements serve local smallholders and resettlement projects, but retrenchment of the state as well as state failures have severely curtailed their leadership role (Kinsey and Binswanger, 1993).

In this paper, we seek to differentiate the role of private investors at the farm development stage from the operational stage. Investors in land development may find it more profitable to subdivide parcels and rent out the land or sell it off to family farmers who are more efficient in the operational phase. In fact, government land concession contracts could explicitly require companies to invest a minimum in land development as well as provide land-bank type financing for family farmers to take over each parcel. During the land development phase, the investor may undertake land surveys, construct roads, provide initial extension advice and recruit and organize settlement. The transition from large-scale ownership in the development phase to family farming in the operational phase takes time, but most investor-owned farms have eventually found it expedient to devolve operations to more efficient family farms. Where land and financial markets are working well, investments will eventually raise land prices and expose the high overheads and transactions costs of investor-operated farms relative to family farms. Further, many costs fall after an industry is established—especially some of the initial technology testing and specialized infrastructure, allowing small farmers to enter at much lower cost.

The distinction between large-scale investments in land development and smallholder operations also occurs spatially. For example, a classic operational structure involves a nucleus estate operated by an investor-owned company which provides a guaranteed supply to a vertically integrated processor, combined with outgrowers who are contractually obligated to sell to the same processor. Operation of a nucleus farm may convey other advantages in terms of allowing experimentation on crops and technology, as well as a demonstration of the productivity of the land that enhances its market value when nearby land is sold or rented to family farmers. In some cases, wage labor in company operations offers workers a leg up the tenancy ladder, if the skills and savings they acquire can be used to access farmland of their own through sharecropping, rental and eventual ownership.

The temporal and spatial combinations of outside investment and family farming are pictured in Table 1. Investors have a potentially large role on the right hand side where heavy upfront costs and skills are required to convert low productivity land to high productivity land, and may have a role in the operational phase but family farms are usually major players in that phase in all cases.

When such investments in land development are made over large areas, they can be transformative in terms of economic development of a region as for example, irrigation projects in arid areas. The private sector is naturally reluctant to engage in large land development projects unless land markets are well developed and land tenure is secure. Also investment in land is inherently risky not only because of the usual climatic and market risks of agriculture, but because such investments are immobile and vulnerable to political disputes with very low salvage value in the event of failure. Facilitating rapid turnover to family farmers would help investors recoup their funds quickly and limit political as well as agro-economic risks. The state may also be able to use guarantees and cost-sharing agreements to attract investors, and also provide local public goods such as agricultural research stations, extension, schools and clinics to attract smallholders and workers.

Historically and even today, the major incentive offered by the state to investors in land development is the provision of large land concessions to investors. Collier and Venables (2012) nicely review state policy alternatives, where investors may seek a large land concession that has a speculative or option value whose future value will be enhanced by the initial investment operation. Their analysis rationalizes a subsidy to investors in the form of cheap land, but they do not explicitly consider the land development phase, and the potential that many such investments may be destined for in situ or settler family farms rather than “mega-farms”. The main downside of such concession arrangements is the involvement of the state in allocating large tracts of land with inherent risks from rent seeking behaviour or weak capacity to negotiate and monitor investments to enhance social objectives.

Table 1. Organizational structures for land development and farm operations

		Relative productivity of developed land to undeveloped land	
		Low	High
Products suitable for family farms (most crops)	Land development	Family farms	Investor
	Farm operations	Family farms	Family farm in situ & immigrant settlers. Nucleus-outgrower
Products suitable for company farms (plantation crops, high value products and some livestock)	Land development	NR	Investor
	Farm operations	Extensive cattle operations	Investor Nucleus-outgrower Contract farming

Note: NR = not relevant, since land suitable to attract investment in plantation crops and high value products will require high-value, developed land.

A brief history of private investment in land development

Private investment in land development has a long history in the settlement of the Americas and Australia, as well as more limited examples from tropical frontier areas of Africa and Asia. Our review starts in the last part of the 19th century during what has often been termed the golden period of globalization, when capital (and labor) flowed freely across borders, new land was being opened to settlers, and private investment in land development was often encouraged by cash-strapped states. We exclude cases where the land development was based on state financing, even when the development was outsourced to private companies (e.g., the Gezira Irrigation Scheme in Sudan).

Table 2 provides a chronological list of the 16 major examples discussed below. While the list is not exhaustive, it provides suggestive evidence that the burst of private land development investment in the late 19th century was followed by a long period in which state-led and other forms of finance dominated agricultural expansion. For the entire 20th century we found only four examples, of which two arose in the 1990s, just before the second burst of private investment in agricultural land after 2000.

To describe these 16 case studies, we look first at the earlier historical period and then turn to the contemporary examples, and for each time frame we divide the examples into three categories corresponding to the distinct agroecosystems of rainfed areas, irrigation schemes, and tree crop plantations.

Table 2. Chronological summary of land development examples

Years	Country/Region	Developer	Principal Objective	Principal Investment
1860s-early 1900s	Thailand – Chao Phraya Delta	Siam Canals Land and Irrigation Company	Private development with “spontaneous” settlement	Irrigation canals
1870s-1890s	United States - Red River Valley	Bonanza Farms	Large-scale farming and demonstration of the land value	New Technology and Strategy
1880s-early 1900s	Argentinian Pampa	Santa Fe Land Company	Organized Colonization	Migration and Settlement
1880s-early 1900s	Canadian Prairies	Saskatchewan Valley Land Co & many others	Organized Colonization	Migration and Settlement
1880s-1890s	United States - Etiwanda and Ontario, California	Ontario Model Colony	Organized Colonization	Irrigation and settlement
1880s-1890s	Australia - Murray River	Mildura Irrigation Co.	Organized Colonization	Irrigation and settlement
1930s-19060s	Brazil – Parana State	Companhia de Terras Norte de Parana	Organized Colonization	Roads and settlement
1940s-1960s	Australia – Ninety Mile Desert	Australian Mutual Provident Society (A.M.P.)	Organized Colonization	Land Clearing and Soil Amendment; Migration and Settlement Processes
1990s-present	Sub-Saharan Africa - Various Countries	Illovo Sugar	Nucleus Farm with Outgrowers	Irrigation; Processing and Specialized Infrastructure
1990s-present	Uganda	Kakira Sugar	Nucleus Farm with Outgrowers	Irrigation; Processing and Specialized Infrastructure
2005-present	Nigeria - Benue and Kwara States	Olam Nigeria Ltd.	Contract farming but change of focus to own large farm with outgrowers	Irrigation; Processing and Specialized Infrastructure
2006-present	Brazil – Cerrado	BrasilAgro	Land development and sales	Land Clearing and Soil Amendment; Migration and Settlement; Pioneering Technology and Strategy
2010-present	Brazil – Cerrado	SLC Landco	Land development and sales	Land Clearing and Soil Amendment; Migration and Settlement
2009-present	Ghana - Volta Region	GADCO	Nucleus farm working with in situ smallholders	Irrigation; Processing and Specialized Infrastructure
2010-present	Zambia - Kafue District	InfraCo	Nucleus farm with outgrowers	Irrigation; Pioneering Technology and Strategy
2010-present	Sub-Saharan Africa (Ghana, Malawi, Mozambique, Tanzania, Zambia)	AgDevCo	Nucleus farm with outgrowers	Irrigation; Pioneering Technology and Strategy; Processing and Specialized Infrastructure

Historical experiences with private investment in land development

Rainfed areas

In the late 19th century, private agricultural colonization companies serving rainfed areas were common in the Canadian Prairies (e.g., the Saskatchewan Land Company), the USA prairies (e.g., the famed bonanza farms), Argentina (e.g., the Santa Fe Land Company), and Australia (e.g., the Australian Mutual Providence Society's scheme to develop the Ninety Mile Desert). Governments usually provided large land concessions to companies that in return undertook to build basic infrastructure, especially railways and farm roads, as well as survey, subdivide and market the land from the concessions. These companies in return raised funds on global capital markets, often from Britain, and agreed to a program of settlement with maximum limits on the land allocated to individuals. Settlers in turn were financed for a few years through a mortgage with the company.

Colonization companies did not usually incur major land development costs beyond the roads and sometimes the clearing of natural vegetation. Nor did they usually operate farms themselves although they often undertook some experimentation and demonstrations. An extreme and well known example were the short-lived bonanza farms in the Red River Valley of the Dakotas, where companies applied steam power to operate very large mechanized farms with employee managers, on-site mechanics and laborers. This proved not to be a profitable mode of farm operation, but did demonstrate the agricultural potential of untried land and enhanced the value of the land that the companies had obtained as part of the concession to construct a railroad (Drache, 1964).

Experiences with colonization companies were highly variable especially in the early years, when states lacked capacity to conduct due diligence or worse, engaged in corrupt practices with companies of low repute (Ely, 1918). The experiences in the 20th century appear to have learned from these mistakes and produced some outstanding success stories. One of the largest was the Companhia de Terras Norte de Parana (North Parana Land Company in Brazil), owned and financed by British investors. Over a period of 35 years, 1932-67, the company constructed roads and railways and surveyed and cleared 1.25 M ha land area in Parana State. In the process it established 39,000 small farms with secure titles with an average farm size of 20-40 ha (Box 1). A less known example is the settlement of the Ninety Mile Desert in South-eastern Australia from 1949-64 on an area of 340,000 ha, by clearing low scrubland and adding trace elements and superphosphate that established highly productive farmland in what was previously very low productivity land used for extensive grazing. In both cases, the investments were transformative—the companies operated profitably over decades and left a lasting legacy of family farms with both efficient and equitable distribution of highly productive land.

Box 1. Historical examples of land development for rainfed farming

The Parana Land Company

After costly and very slow progress with state-led settlement, the government of the Brazilian state of Parana turned to the private sector, a British-owned company Companhia de Terra Norte de Parana (Parana Land Company) later sold to the Brazilian owned Sociedad de Melhoramentos e Colonizacao (SOMECO) (Katzman, 1978; Nelson, 1973). The initial interest from Britain was led by Simon Fraser (Lord Lovat) who had previous experience with the colonial Gezira Scheme in Sudan. In agreement with the state, the company purchased 1.25 M ha of extremely sparsely populated area at an average of \$1.25/ha. From 1932-67 the company built 350 km of rail and 5,000 km of road as well as undertaking surveys and securing the title to subdivided land. The scheme included surveying of future towns where land sales probably provided the largest returns to the company. Settlers with an average size of farm of 20-40 ha were offered a 4 year mortgage with a 20% down payment. Given that the company sustained the investment over 25 years, it appears that the investment was profitable to the company and certainly transformative in terms of the development of the state of Parana.

The Australian Mutual Provident (AMP) Society

The AMP Society Land Development Scheme in southeastern Australia has some parallels to Parana as well as important differences (Fergusson, 1984; Bell and Cairns, 1958; Holden, 1970). The AMP Society Ltd was an insurance and real estate company and provision of mortgage financing to farms was part of its portfolio. Finding itself with surplus capital after World War II, one of the company employees managing its rural portfolio convinced the company to invest in land development in the Ninety Mile Desert where government scientists had recently discovered that micronutrient deficiencies were the major cause of its extremely low soil fertility. In agreements with the states of South Australia and Victoria, the company took over 340,000 ha of land in 1949 to develop over a 15 year period. Investment in clearing of low scrub, heavy application of superphosphate and micronutrients, and sowing of improved pastures increased the livestock carrying capacity of the land 40 fold. After five years of land development lots including a house were allocated at random to interested workers from the development phase on a ten-year mortgage. The company maintained a central farm for demonstration and experimentation of appropriate management practices. The return to the company was estimated at 5% in real terms (Holden, 1970).

Irrigation schemes

There were very similar experiences of private development of irrigation schemes starting from the late 19th century. Irrigation involving canal infrastructure requires deep pockets and more expertise than settlement in rainfed areas, but the impact on land productivity and land prices in arid zones can be dramatic. Many of the irrigation projects in the western USA were established through private investment in land development and water works, as was the case in Mexico (including the Yaqui Valley of later green revolution fame), Brazil, Australia's Murray River and Thailand's Chao Phraya Delta. As in the colonization projects, the private investment was in the land development phase,

after which irrigated and cleared land was made available through medium-term loans to settlers. In the case of Thailand where such financing for settlers was not available, land was sold to richer urban-based owners who then leased the land to tenants for operation (Feeney, 1979). As with the colonization companies, the record of success is quite variable, although the Murray River Schemes in Australia and the Imperial Valley Scheme in USA went on to become horticulture baskets for their nations (Box 2).

Box 2. Historical examples of land development through irrigation

Chaffey Brothers Ltd.

George and William Chaffey, originally from Canada, established two of the early irrigation schemes in California (Etiwanda and Ontario) in the 1880s (Hamilton-McKenzie, 2010; Kershner, 1953; Wells, 1986; Hill, 1937). Based on their success in California, Chaffey Brothers Ltd was granted up to 100,000 ha in South Australia and 100,000 ha in Victoria in 1887, in an arid zone about 200 km north of the Ninety Mile Desert described in Box 1, through agreements with the respective state governments.

The Chaffeys were able to raise most of their finance from private sources abroad, with the objective of selling land to establish small family farms of less than 80 acres. In South Australia, the company recruited and provided land to the settlers on a 10-year loan and a 5% down payment. It also established the Renmark Irrigation Company that owned and managed the irrigation system. Each farmer owned shares in the irrigation company according to their land area with the eventual target of full ownership by the settlers. The company was required by the terms of the contract to establish all irrigation and road infrastructure, clear the land, plant the fruit trees, and establish an agricultural college for training farmers. The state government closely supervised the scheme, releasing new land based on a strict program of investment and completion of infrastructure.

The scheme got off to a good start but was hit by the worst financial crisis in Australian history in 1891 that decimated the market for fruits and vegetables, the main products of the scheme as well cutting off investment from abroad. There were also technical issues related to choice of crops and varieties, diseases, and heavy loss of water in transmission. The innovative approach to farmer ownership of the irrigation system ran into problems due to poor communication with settlers expecting free water. At the time, settlers were also unhappy with the rather un-Australian prohibition on alcohol sales in the new colony. The company folded in 1895 and the state had to rescue the scheme financially. However, George Chaffey then returned to California to help establish the Imperial Valley irrigation scheme.

Despite these difficulties these investments were transformative in the development of sparsely populated areas although in light of recent prolonged droughts in both Australia and California, some argue that irrigated agriculture had little role in these water scarce environments (e.g. Hamilton-McKenzie, 2010).

Tree crop plantations

Establishment of tree crop plantations may involve land development if it requires roads/rail to remove bulky produce (e.g., oil palm, bananas, sugarcane), there are pioneering risks of new crops in new areas, and large scale or specialized processing or shipping infrastructure is needed to handle perishable products. This kind of development has generally been initiated by investors with state support through land concessions. In some cases, the developers have devolved farm operations to smallholders or have operated a nucleus estate with outgrowers.

A pioneering case of land development for tree crops is the establishment of rubber in Southeast Asia. Until around 1900, all rubber was harvested from the wild but this was not able to keep up with demand, especially after the dawn of the automobile age. A great deal of trial and error took place in Malaysia to select suitable species, planting materials, and tapping methods. Plantation companies led this effort aided by colonial scientists and by 1914 over half of world rubber came from cultivated trees rather than wild harvests. The success of the plantation companies had immediate spillovers to smallholders who were able to draw on the methods and infrastructure developed by the companies as well as incorporate rubber into their extensive agro-forestry food systems and develop simple processing technologies. Today, Asia produces over 90% of the world's rubber and nearly 90% of this is produced by smallholders (Byerlee, 2014).

Since 1950, the Commonwealth Development Corporation, a private for-profit company established by the British Government, has pioneered efforts to enhance the social impacts of private investments, building on long colonial experience. About 40% of CDC's 179 investments have included an outgrower component or were based entirely on smallholders after the development phase (either in situ smallholders or migrant settlers from other regions). The record is quite varied with only one third of projects reviewed by Tyler and Dixie (2013) showing financial success in the project period although over the long run 70 per cent eventually showed a positive bottom line. Nucleus-outgrower projects had higher rates of success and also greater development impacts (over 80% were rated as successful or moderately successful for development impacts). However, CDC success with smallholders has been confined to crops where the company had a monopoly on processing (e.g., oil palm, tea and sugarcane) and payments for loans could be subtracted from the mill price. In new areas, the nucleus estate provided the opportunity to experiment and adapt, before adding outgrowers. Some of CDC's successes have been transformative such as oil palm in Asia and sugarcane and tea in Africa. For example, the Kenya Tea Development Authority a private smallholder owned company set up through a CDC loan has converted Kenya into the world's leading tea exporter based largely on smallholders that now obtain yields close to that of large tea estates (Box 3).

Box 3. Historical example of tree crop development with smallholders

The Kenya Tea Development Authority

Tea in Kenya is one of Africa's most remarkable export and productivity success stories (Tyler and Dixie 2013; Mitchell, 2012). Smallholders have played a central role in this success through ownership of the tea processing sector. In Kenya, the world's largest tea exporter, smallholders account for a 62 percent share of national tea production. Significantly the yield gap between smallholders and estates has fallen from 68 percent in 1980 to 18 percent today. The Kenya Tea Development Authority was established with support from the CDC in to invest in smallholder tea and tea factories. KTDA was eventually privatized in 2000, under ownership of smallholder tea producers. KTDA provides inputs and advisory services to 550,000 smallholders with an average of 0.4 hectares and management services for 63 smallholder-owned factories. KTDA built on the infrastructure, technology, and know-how provided from initial investments in large-scale estate production while the state provide land with secure title and promoted a business friendly approach for smallholder tea development.

Lessons learned from the historical case studies

There is a long history of private investment in land development. Our brief and undoubtedly incomplete review reveals that many of the investments have been successful and in some cases, transformative. There is no way to rigorously compare the effectiveness of the private sector model with the more common state-directed models, but Nelson (1973) in a review of 24 land development schemes in tropical Latin America found two of the most successful were private sector led (including the Parana Land Company in Box 1). Likewise, in South Australia the private model of land development in the Ninety Mile Desert performed better than the state-led scheme in the same ecology on Kangaroo Island (Fergusson, 1984).

However, it is also clear from the cases reviewed that private land development schemes are risky to investors and participating farmers alike. By definition these are pioneering ventures with few precedents and no guarantees. For the investors, risks include the technological, climate and market uncertainty inherent in all new agricultural investments, plus political and institutional challenges in building new governance and contractual relationships. Nearly all of the projects required a considerable period of experimentation, learning and adjusting to arrive at suitable crops, varieties, irrigation management practices, and machinery design. Land development projects are especially risky since they create an immobile asset that cannot be easily disposed of during economic hard times.

Participating farmers and settlers also experience risks not just from climatic and market volatility, but also from company actions that are unanticipated by farmers or unplanned such as financial difficulties of the company. In many of the early projects, inexperienced and speculative companies did not bring the expected financial backing or expertise to the investment (Ely, 1918). Farmers themselves were also often inexperienced and unsuited to the schemes. The AMP scheme is perhaps unique in that the workers in the land development phase were specifically selected for their future suitability as farmers

and then given additional training and experience during the five-year development phase before they were allocated their farm blocks (Fergusson, 1984). Other schemes such as Siam Canal, Land and Irrigation Company's irrigation investment in Thailand did not have an explicit objective of creating a class of owner-operated farms, and they experienced high rates of tenancy and inequality (Takaya, 1987; Tanabe, 1977).

Local communities and especially indigenous groups were also often at risk especially where governments provided land concessions to investors without consideration of existing land users. The Sonora and Sinaloa Irrigation Company and its successor in northwest Mexico for example, engaged in a long running land conflict with indigenous groups, even though they were ostensibly eligible to take up profitable farming of parcels in the new irrigated land blocks and many did (Hu-Dehart, 1974; Radding, 1987). Likewise, many of the plantation companies based on land concessions experienced growing land conflicts as the local population expanded in part due to immigration attracted by the new industries.¹

Even if private investors perform better than state led schemes, an important question is whether there are economies of scale associated with certain types of investments that justify concessions to large investors in the land development phase. From our review such economies of scale generally follow our framework above—the lumpy and spatial nature of some types of infrastructure, the pioneering technical risks, and specialized knowledge associated with water and land rights, and ability of companies to access global capital markets. The Murray River irrigation scheme imported knowledge of irrigation from California that was not available in Australia. The Parana Land Company often purchased the same piece of land 2-3 times to insure clear title to the land, something beyond the reach of smallholders. In one study, Holden (1970) compared costs of land development for the large AMP scheme and a land development operation one tenth of the size and found modest costs advantages of the AMP scale, even though the smaller operation started a decade later and built on the AMP experience.

Finally, the historical record reveals how private land development schemes were often closely associated with state actions or regulation. In most cases, the state played important roles in defining the social objectives for the investment (e.g. maximum allowed farm sizes), financing of R&D to develop suitable technology, vetting the investors, and monitoring progress. In some cases governments took on roles that they were ill equipped to play, sometimes resulting in collusion between state officials and private investors. The state also generally played an indispensable role in providing the property rights and contract law needed for family farmers to acquire developed land. Where such institutions were not in place, smallholder repayment of long term loans for the cost of land development was often problematic, as in many of the CDC investments. The exception was where the company had a monopsony on processing that enabled loan repayments when farmers delivered their produce (e.g. sugarcane, oil palm). However,

¹ Note that nearly all of the schemes cleared native vegetation including forests to make way for farming, although environmental concerns on clearing forests only emerged in the later part of the 20th century (Byerlee and Rueda, 2015).

this type of tied credit risks distorting distribution of benefits away from smallholders through monopsony buying practices.

Modern examples of large-scale private investment in land development

The late-19th and early 20th century burst of private investment in land development was halted by World War II, and for most of the second half of the 20th century was supplanted by public financing for rural infrastructure and settlement schemes (Kinsey and Binswanger, 1993). Since the 1970s, however, private companies have invested substantially in land improvement in the rainfed Brazilian Cerrado and in irrigation schemes. Private companies, including Brazilian firms, have also invested in land development in Africa through irrigation infrastructure, plantations and potentially in the Africa savannah areas. Here we review those experiences that focus on land development but with significant participation of family farmers in the operational phase.

Rainfed areas

The Brazilian Cerrado is a huge area of over 200 M ha that has been the frontier of agricultural expansion in Brazil and indeed globally. It is a savannah and woodland ecology characterized by undulating topography and reasonable rainfall but infertile acid soils. Research by the Brazilian agricultural research corporation, EMBRAPA, provided the technology in the form of soil amendments and adapted varieties to enable conversion of natural areas and low grade pastures to productive farmland. However, heavy applications of lime, superphosphate and micronutrients were required, along with significant transactions costs of acquiring land, securing the land title, and complying with a myriad of environmental and other regulations.

After public investment in a major highway across the Cerrado in the 1960s and private investment in processing and port logistics in the 1970s, the Cerrado has become a soy basket for the world. Following the historical success with colonization companies in southern Brazil, more than thirty-five specialized private enterprises organized more than 104 settlements in the Cerrado. These companies provided many of the initial investments for land development including access to credit for soil amendments, securing land titles, extension advice and some road and other infrastructure. They made their money by selling the improved land to small family farms facing land shortage in the south of Brazil, including many that had been established one or two generations earlier by the North Parana Land Development Company (Box 1) (Jepson, 2006).

A parallel institutional innovations was the emergence of land development cooperatives that were off shoots of cooperatives in the south. These cooperatives reduced transactions costs and pioneering risks of settlement in a new area with a different agro-ecological and institutional base by providing the same set of services as the private colonization companies (Bickel, 2003; Jepson, 2006). One noteworthy example is the Cotrirosa cooperative from Santa Rosa in Rio Grando do Sul state that settled 60,000 hectares in the Cerrado region and developed a new town called Nova Santa Rosa (Bickel, 2003). Note, however, that both the private companies and the cooperatives depended largely on state credit that was heavily subsidized in the early years.

Although the private colonization companies and cooperatives helped many family-type farmers, the high pioneering costs and risks also gave an advantage to large agribusiness farms. Many of these companies got their start in the settlement of the Cerrado in Mato Grosso state, and as the Brazilian public sector reduced its role very large agribusiness companies are leading the development of a new frontier in the 21st century—the so-called Mapitoba region consisting of parts of the states of Maranhão, Tocantins, Piauí and Bahia. Specifically, as many as 38 large-scale agribusiness companies currently operate farms in the Brazilian Cerrado of at least 30,000 hectares, and seven have farms of 100,000 hectares or greater (Chaddad, 2014; Byerlee et al., 2015). Two of the biggest companies, BrasilAgro and SLC Landco focus at least part of their operations on land development, largely by purchasing under-developed properties and investing to convert natural or degraded pastures to highly productive cropland and then selling on the open market (Box 4). SLC Agricola for example claims to buy land for \$2-3,000/ha and then sell it for \$6-7,000/ha after investing in land development over a two-year period. These are largely market-based transactions that depart for the explicit colonization objective of the earlier companies. The resulting farms are, like their counterparts in the US and Canada, mostly family-run farms although larger, averaging over 1,000 ha.

Box 4. On-going investment for the continued development of the Cerrado

BrasilAgro

BrasilAgro was founded in 2006 through an IPO worth 584 million Brazilian Real (approximately USD 220 million), with a 40% stake owned by a large Argentinian agribusiness company called Cresud. Since 2006 BrasilAgro has expanded its land portfolio to include eight properties in the Brazilian Cerrado as well as a recently purchased property in Paraguay (Chaddad, 2014). Of its total acquisitions of 319,000 ha, 110,000 ha have been developed. BrasilAgro is now one of the largest land development and farming companies in South America, and it stands out for its innovative business model specifically focused on land acquisition, development, operation and land sales. In order to maximize land productivity, BrasilAgro invests in land clearing, levelling, soil amendments and land preparation, as well as roads, warehouses and irrigation systems (Chaddad, 2014). Additionally, BrasilAgro's business model focus on land development rather than farm operations as it sells off properties after they have been developed (Chaddad, 2014: BrasilAgro, 2014).

SLC Agricola and Landco

SLC Agricola operates in a similar field to BrasilAgro, but with greater focus on farming than land development. As of 2012, SLC Agricola operated 14 farms throughout Brazil with a total land area of 308,000 hectares. They have focused on land transformation through soil amendments, infrastructure construction and other means, as well as agricultural production, processing and storage (SLC Agricola, 2012). Along with its main operations, SLC Agricola created a spinoff company called SLC Landco in 2010, which specifically focuses on land development, and is jointly owned by SLC Agricola and Valiance, a British-owned asset management fund (Braga, 2012).

In Africa, there has been much discussion and controversy over a Brazil-Japan-Mozambique initiative ProSavana in Mozambique to draw on the Cerrado experience to open up land along the Nacala corridor in the north of the country, again focusing on soybeans. Major investments are required in infrastructure, some land clearing and soil amendments and the government of Mozambique initially turned to large investor-owned farms. However, land tensions with smallholder farms some of whom were successfully producing soybeans has led to some refocusing of the ProSavana strategy toward nucleus farms as a way to stimulate smallholder production through contract farming. It is unclear that this strategy will work given the difficulty of providing long term financing for land development through contract farming, so other forms of smallholder farm finance and product marketing may be needed (Ekman and Macano, 2014; Tawa, Amameishi and Noguchi 2014; Hanlon and Smart, 2012).

The Mozambiquan experience is particularly relevant to the new generation of agricultural growth corridors (AGCs) in Africa intended to provide access to markets and ports, and to create opportunities for development of commercial agriculture especially in the savannah areas where there is still much uncultivated land suited to crop agriculture. To date, there are four active AGCs – the Beira Agricultural Growth Corridor (BAGC), the Nacala and Zambezi Corridors in Mozambique, and the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) and more are planned. These programs intend to use a variety of public-private partnerships (PPPs) to build infrastructure and provide services, but the specific roles of the public sector and private investors in land development is still quite uncertain.

Irrigation schemes

After the early experiences with private investment in irrigation in the late 19th and early 20th century, the state began to assume the lead role in large-scale irrigation schemes, often assisted by multilateral financial organizations. However, continued high costs and inefficiencies in state-managed schemes led to a revival of interest in private investment in irrigation in the late 20th century. This is most notable in Latin America, where much of the region's new irrigation investment since 1990 has come from the private sector (Ringler et al., 2000). In many cases, the upsurge in private investment occurred when state-managed irrigation systems were turned over to farmer groups and cooperatives, largely to bring maintenance up to standards in existing schemes. However, in Brazil, private investment has been responsible for about 95 per cent of irrigation expansion in the poor northeast. This area was already densely settled, and some of the investment was made by individual farmers investing in their own irrigation systems, with loans underwritten by government guarantees (Ringler et al., 2000). However, other projects such as the Pontal Irrigation project have been developed by private investors who were provided a 25 year concession with returns obtained from selling water and leasing land (Varma et al., 2012).

Peru also has an excellent track record of private investment in coastal irrigation greenfield projects where land without water has zero productivity since it rarely rains. The Peruvians use a novel system of auctioning rights to develop irrigation and require large down payments and well-developed business plans to ensure transparency and

avoid speculation (Deininger and Byerlee, 2011). In some cases, these investments support smallholders but this does not seem to be an explicit objective of the schemes.

Finally, an interesting footnote to our historical review is recent private investment in irrigation in northern Australia. A project to develop about 30,000 ha of land in the Ord River area was awarded in 2014 through an open bidding process to a Chinese company. The project departs sharply from the strong family farm and settler ethos of the earlier private irrigation development initiatives on the Murray River and will operate as a single large-scale unit to produce and process bioethanol feed stocks (sugarcane and sorghum). However, some of the land will be operated by indigenous people (completely ignored in the earlier projects on the Murray) who now have ownership rights and have negotiated significant compensation of about \$50 million for transfer of the land to the private investors (McClellan, 2014).

There are also several recent examples of large-scale investors developing irrigation and utilizing novel business models in Africa. These are most developed in the sugar industry. Firms such as Illovo Sugar Ltd, which is the largest sugar producer in Africa and operates in six countries, as well as smaller companies including Kakira Sugar Limited in Uganda have made substantial investments in irrigation and processing infrastructure. These investments include large outgrower components that build on the investment in irrigation and have enjoyed reasonable success and little controversy (Box 5). They have been effective alternatives for sustainable production in comparison to companies that have attempted to operate very large farms with little local involvement.

Box 5. On-going investment for irrigated sugar production in Africa

Kakira Sugar Limited

Kakira Sugar Limited has utilized an innovative outgrower-oriented business model and significant investments in irrigation and processing infrastructure to become an industry leader in Uganda. Kakira Sugar was founded by an Indian businessman in the 1920s and made a substantial irrigation investment early on. Kakira Sugar was acquired by the Madhvani Group in 2000, at which point it commenced substantial expansion efforts including development of processing infrastructure, power generators, and irrigation systems (Kakira Sugar Limited, 2015; Isabirye et al., 2007). Kakira's outgrower model currently includes more than 7,000 farmers who supply 65% of Kakira's total cane output. Additionally, Kakira provides a variety of services to these farmers including input supplies, agricultural equipment, and training. Furthermore, Kakira has partnered with the Busoga Sugar Cane Growers Association to provide financial services to farmers and organized infrastructure projects such as road construction (Kakira Sugar Limited, 2015).

Illovo Sugar Company

Illovo, a South African-based company, expanded from South Africa through purchases and greenfield projects in Malawi, Mozambique, Swaziland, Tanzania and Zambia. Illovo independently harvests sugarcane on more than 60,000 hectares of land and also purchases sugar cane from outgrowers who operate on a further 112,000 hectares. In particular, Illovo is currently involved in a public-private partnership (PPP)

in Swaziland called the Lower Usuthu Smallholder Irrigation Project (LUSIP) that has combined public and private funds to build irrigation and electrical infrastructure which has helped smallholders to develop 2,600 hectares of land for sugar cane production (Illovo, 2014).

Rice is another crop that requires large investments in irrigation if Africa is to be competitive against rapidly rising imports. Some state sponsored schemes have been revived with considerable success (e.g. Mali and Senegal) on already existing but poorly managed irrigation projects. However, given meagre resources, expansion of irrigation is being driven by private investors. A variety of business models have been attempted. Olam, a large multinational trader, initially focused in Nigeria on contract farming with smallholders but was not able to enforce contracts due to side selling. It has now switched to development of a large-scale farm that it operates with plans to add outgrowers (Box 6). In Ghana, GADCO involving Brazilian expertise, is using a nucleus farm, mill and supply chain that it owns and manages to support involvement of smallholders as the major suppliers by offering a premium price for quality rice. As practically the only domestic supplier of quality rice, this model ensures the enforcement of contracts, but it is too soon to claim success. Other rice development projects appear to have focused exclusively on combining land development and farm operations engendering conflicts with existing land users (Larder, 2015; Oakland, 2014)

Given the high risks and long term payoffs to private investment in irrigation development in Africa a number of public-private partnerships are emerging to improve incentives for private investment while at the same time, ensuring participation of smallholders. The InfraCo design of irrigation for large commercial farms and for smallholders in Zambia with support from the World Bank is an example, but needs more time to demonstrate results on the ground (Box 6).

Tree crop plantations

Large-scale private investment in tree crop plantations in Africa has accelerated in recent years. The largest such investments are for oil palm in Central and West Africa, its original home, led by Asian investors. These investments may amount to \$20 billion if current plans are realized (Hardman & Co., 2012). One of the largest such investors is Sime Darby, the world's biggest oil palm company based in Malaysia. Sime Darby was provided a concession of over 300,000 ha in Liberia in 2009, in return for an anticipated investment of \$3 billion over 20 years, twice the GDP of Liberia at the time. Investments of this magnitude offer the potential of large economic benefits to the country and to the 35,000 employees expected in the Sime Darby operation (Oxford Economics, 2014). However, initial experiences have largely been negative due to conflicts with existing land users within the concession area (as well as the 2015 Ebola outbreak) (Basta, 2014; Lanier et al., 2012; Siakor. 2012). Other investments in the region, such as Herakles in Cameroons have drawn fire from local communities and civil society, not only on land rights but also deforestation in sensitive tropical ecosystems.

What is missing in these recent investments has been a strong state stance on developing smallholders as part of the concession agreement. The early investments in Indonesia as well as in West Africa (e.g., Ghana Oil Palm Development Company) required that over half the area of land provided to companies be designated to smallholders in nucleus-outgrower schemes. The Sime Derby investment in Liberia does provide for a relatively small allocation to smallholders (40,000 ha) but does not provide for financing of the smallholder land development estimated at around \$5,000 per ha or a total of \$200M. Private investment in development of *in situ* smallholder plots does not seem to have been considered as a way to reduce land tensions.

Box 6. On-going investment for irrigated cereals in Africa

Olam

Olam Nigeria Limited (Olam), a subsidiary of Olam International, organized an innovative scheme for rice production featuring a combination of irrigation programs and contract farming. In partnership with USAID, Olam developed a contract farming program aimed at increasing farmers' access to credit, technology and technical assistance, beginning in 2006. This partnership failed due to competition with other rice buyers in the area and was discontinued in 2008 (Johnson et al, 2013). Olam then transitioned to focus on direct rice production on its own farm through a concession by the government of Nigeria. Olam invested up to USD 49.2 million into rice production including construction of irrigation infrastructure and a milling facility in the Nasarawa State, and research programs related to new rice varieties (Johnson et al., 2013; Feed the Future–GLEE, 2013). Between the nucleus farm and the outgrowers, Olam seeks to process up to 60,000 tons of rice paddy annually with 65% of the paddy produced on the nucleus farm and the remaining 35% purchased via outgrower cooperative agreements with smallholders (Johnson et al., 2013; Rockefeller Foundation, 2013).

Chiansi Project

The Chiansi Irrigation Infrastructure Project in Zambia project stands out as an example of a private firm developing irrigated land for use by smallholders. InfraCo designed the program using a \$3 million investment from the Private Infrastructure Development Group (InfraCo, 2014). Some 80% of the land utilized for this program has been leased by smallholder farmer cooperatives to commercial farm-operating companies in exchange for equity interest in the companies and free access to irrigation on the remaining 20% of land area. The irrigation program is intended to reach approximately 2,500 hectares of previously undeveloped land, and will be managed by an Infrastructure Services Company co-owned by the Zambian Government and a Trust managed by farmers and investors (Palmer et al, 2010).

Potential of private land development today in Africa

Successful private initiatives for land development can be found today in Latin America, where land and water markets and financial markets work well. There are large

companies in Brazil specializing in land development for subdivision and sale or rental, and also successful examples of concession operations for private irrigation development for family farms, mediated by the state. Private investment in land development has similar potential in Africa where capital scarcity is acute, the need for land development great and state capacity is weak. At least two prerequisites are needed to extend the land development model successfully to Africa.

First, both investors in the land development phase and family farmers that take over for the operational phase require secure tenure rights. In the rare case where a local population has secure access to land local communities could potentially undertake collective action to contract a specialized investor to improve land and water resources in exchange for payments made possible by the resulting productivity gains. But the transaction costs involved in negotiating such deals are surely high, and in any case such arrangements cannot serve areas where land development would need to attract immigrant farmers from other locations. In sparsely populated areas, investments that attract immigrant farmers have historically been important in developing an agrarian structure based on small and medium scale family farms. However, transactions costs of three-way negotiation of an equitable deal between in situ communities, immigrant settlers and investors are high especially where immigrants are from different ethnic groups.

Second, investors require the ability to enforce contracts with tenant farmers or farmers who are purchasing land with long term loans provided by the companies. In the absence of strong contract law and its enforcement, the arrangement only work for a few crops like sugarcane, where the company has a processing monopoly that can enforce loan repayments.

Since the key prerequisites are mostly not in place in Africa, land developers have little choice but to pursue company-owned large scale agricultural production after the land is developed. There has been much discussion of public-private partnerships to facilitate smallholder access to land development and reduce the risks to private investors. Although some of these initiatives are being piloted it is too soon to assess their success. Nonetheless, we believe that the experience in other regions demonstrates the potential of focusing private investment on land development for family farming. Governments that are giving out large land concessions at bargain rates could be building in stronger requirements for investment in land development and inclusion of smallholders to offset the risks and transactions costs inherent in the use of the land development model. In the long run, the transfer of developed land to independent smallholders or outgrowers is likely to be not only more equitable but more efficient as well.

Conclusions

Investment in land development in some settings can create a highly productive asset that can be transformative for local economic development. However, many of these investments such as irrigation, basic infrastructure and roads, and pioneering risks and costs are associated with significant economies of scale and are beyond the reach of individual family farmers. For much of the 20th century, governments were the major players in land development but this was not always so: historical examples mostly from

the late 19th and early 20th century reveal that private investors can be attracted to developing farmland, in ways that are somewhat similar to private development of new urban housing areas designed for subdivision to individual owners.

Significant economies of scale and shortage of public resources open space for the private sector to invest in land development, a role that has been overlooked in the burgeoning literature on large-scale land acquisitions in recent years. Our review has shown a plethora of historical examples globally as well as contemporary examples from Latin America where the private sector was the major investor in large-scale land development. In the most successful cases, the investor focused on the land development phase and then turned the farm operations over to individual family farms through land sales or rental. The state generally played an important regulatory role in these schemes and made state concessions of large tracts of land conditional on developing a family farm agrarian structure.

We believe that investment in land development is critical in Africa, and that the levels and types of capital needed can be deployed only by attracting private investors. Doing so will require appropriate government policies, including frameworks designed to facilitate transition of newly developed land for rental or sale to smallholders. Considerable experimentation and learning may be needed to develop models appropriate to the African context, but historical precedents exist for governments, investors and farmers to move beyond the rhetoric of land grabs and recognize the essential role of private land development in many successful family farming systems.

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