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ABSTRACT

Land deals in Africa: pioneers and speculators*

Much African land currently has low productivity and has attracted investors purchasing (or leasing) land as a speculative option on higher future prices or productivity. If land deals are to be beneficial they need to induce productivity enhancing investments. Some of these will be publicly provided (infrastructure, agronomic knowledge), and some can only be provided by 'pioneer' investors who discover what works and who create demonstration effects. Such pioneers can be rewarded (incentive compatibly) for the positive externalities they create by being granted options on large areas of land. However, pioneers must be separated from speculators by screening and by requirements to work a fraction of the land.

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1. Introduction

Land use in Africa has differed markedly from that in much of the rest of the world. In the OECD and most developing regions land is scarce and there is plentiful demand for it from investors. As a result rents are bid up by competition, existing landowners capture the entire economic surplus through the price of the lease, and investors' abnormal profits are correspondingly reduced to zero. Price discovery – the appropriate level of land prices or rents – is straightforward and can be done by auction or simply through the operation of a thick market where trades are frequent and easily observed. In contrast, in much of Africa land is abundant and investors are scarce. Since it is the scarce factor that captures the rent, this goes to landowners in the OECD, but to investors in Africa. Given this starting point, African governments face a dual challenge in designing land deals. The first is that deals need to capture a share of the benefits of commercialization for society. The second is that deals should initiate transition to a situation similar to that which prevails elsewhere, in which land is the scarce factor; this requires investments – by government and by private investors – to raise land productivity, hence attracting investor interest and stimulating demand.

Until recently there was no demand from international investors for African land. Quite suddenly since around 2008, there has been incipient demand for large, commercial holdings to be leased from governments. The scale of announced deals in Africa was estimated in 2011 to be in excess of 40 million hectares, approaching 2% of African's land area.[1] The size of these deals varies widely, with median project size of 40,000 hectares and more than one quarter of projects exceeding 200,000 hectares. However, implementation of deals has been slow, with many falling through. Where implemented, the rate at which investors have actually developed land has also been slow, so little land has so far been developed. Rents paid on land have typically been minimal, in the range $6-$12 per hectare pa in Mali and $3-$10 in Ethiopia, as compared to US agricultural land rents in excess of $200 per hectare.[2] And so far, there is little evidence of substantial employment generation or of other wider benefits deriving from these projects.

The low productivity of much African land currently is a conjunction of factor endowments and how agricultural production has been organized. As to factor endowments, the region has

[1] These facts are drawn from Deininger and Byerlee (2011). For comparison, global cultivated land area is 1.5 billion hectares, increasing at around 1.9 million hectares pa.

[2] Across EU countries they are in the range €100 – 240 per hectare.

an unusually high ratio of land to labour and capital, implying a low marginal product of land. Indeed, in some countries a majority of land is currently not put to any significant economic use. Deininger and Byerlee identify 450 million hectares of land that is potentially available for development worldwide, of which 200 million hectares are in Sub-Saharan Africa.[3] Current yields on comparable African land under cultivation are typically less than 20% of 'potential' yields (Deininger and Byerlee figure 3.5).

As to the organization of production, the dominant mode in which African land is currently put to productive use is smallholder agriculture. While small farms often achieve high output per hectare this is because of very high inputs of labour. Using the more appropriate metric of total factor productivity there are scale economies even over the range of family farms. Complementing these scale economies in the physical yield of particular crops are scale economies in converting yield into value. Technological innovation, finance, fast and reliable logistics, and marketing connections have all become increasingly important and all favour large commercial organizations over small family farms (Collier and Dercon, 2008). Yet, not only is the average size of African smallholdings very small, over recent decades farms have been getting progressively smaller. For the actual size to be getting smaller while the efficient size is getting larger is only possible if there is severe market failure. This is indeed the case in African land markets. Rights to land are generally customary. The dominant transfer of ownership is through inheritance. There is usually no market mechanism whereby a commercial firm could acquire the use of land from households. Such African land is gradually becoming more marketable, but the process is very slow and associated with high-value, irreversible, long-lasting smallholder investments such as tree crops (Besley 1995).

Such areas are the least interesting for transfer to commercial exploitation: the key opportunity is constituted by the vast areas of under-utilized land in which there has been no investment and which has negligible productivity in its current use. The natural evolution of marketable land rights for such land may take many more decades. In such circumstances the government has a potential role in using its legal authority to substitute for the lack of marketable rights. Underutilized land can be assigned by the government to new leaseholders, which existing claimants on the land lack the authority to do. Potentially, this can be mutually beneficial to existing claimants to the land, to government and to leaseholders. While it is important not to infringe local rights to land, it is also important not to exaggerate them.

[3] The criterion of potential availability is non-cultivated, suitable for cropping, non-forested, non-protected, and with population density of less than 25 people per km^2.

Where huge areas of land are very lightly exploited relative to feasible alternative uses, and the user does not have the right to sell the land, in creating saleable leases the government adds considerable value. It is reasonable for some of the gains from this extra value to accrue to all citizens rather than being shared only between the local population and the investor.

Long term land leasing of this type raises a host of important issues: how existing local claims on the land should be compensated, access to complementary inputs (above all, water), the consequences for local employment and incomes, and the sustainability of different uses. Best practice for these issues has been extensively discussed elsewhere, and the focus in this paper is on the terms on which it would be appropriate for the government to lease land: the price, the duration, the conditions imposed on purchases, and the associated commitments made by government. [4]

The current position we characterize as '*land-abundant, investor-scarce*'; demand remains very small relative to potential supply and, since African land is divided among many governments each in control of abundant land, an individual government may face just a single prospective purchaser who has the option of approaching other governments. As a consequence, a market-clearing auction price would presumably be very low and, to date, the terms commonly agreed have sold leases at prices which have been essentially nominal. The situation to which Africa (or at least, particular regions within Africa) needs to transition is one more like that currently prevailing in the OECD, where land has high productivity and high value, becoming the scarce factor; the '*land-scarce, investor-abundant'* case.

While this transition is unlikely to happen in the foreseeable future throughout Africa, it could happen in some regions. The possibility that this transition might occur has two important implications. The first is that land has expected future value which should be factored into current land deals. This can be thought of as an option value, since holding land now carries with it the possibility of profits from later development when the land has acquired value. The second is that the determinants of the transition need to be understood. To some extent these are exogenous to a particular African country, depending on the future of commodity prices. But a large component is also endogenous, depending on the actions of government and investors to improve the productivity and commercial attractiveness of the

[4] Best practice for handling these issues has been extensively discussed, for example Cotula (2011), Deininger and Byerlee (2011).

land. This endogenous element must be factored into selection of regions for development, the structure of land deals, and the supporting actions of government.

The remainder of this paper analyses policy for such a transition. There are a number of trade-offs. Government should seek to capture the benefits of rising land values, particularly in so far as they include the value of publicly funded infrastructure and agronomic improvements. At the same time, government needs to attract investment, particularly in the early stages. Early investors will be attracted by large land holdings that have an option value due to the possibility of future productivity increases. On the one hand, this creates a risk of land being held for purely speculative reasons. On the other, it may attract 'pioneer' investors who undertake the discovery process, establishing what techniques work best in the new environment. This discovery process creates spillovers (most of them specific to the particular region) that raise expected productivity, encourage further investors, and are a crucial part of the transition. Offering options on large areas of land are a good incentive for pioneer activity, but government has to be able to manage and reduce the risk that such schemes attract speculators not active pioneers.

2. The Option Value of Land and its Implications

As noted above, agricultural rents per hectare are currently 20-50 times higher in the USA than in some areas of Africa. Such large spatial differences in the productivity of a factor may indicate unexploited profitable opportunities for enhanced output. However, they may also be a symptom of some offsetting effect which depresses productivity. For example, for many decades an equivalently wide gap in labour productivity (and hence wages) between Europe and Asia persisted and indeed widened. It was not until around 1980 that firms at last began to find it profitable to relocate employment from high-wage Europe to low-wage Asia: until then the wage gap reflected a genuine equilibrium difference in the productivity of labour. Once this threshold was crossed the relocation of employment was explosive so that the wage gap began to narrow. Even after three decades the process is far from complete: the wage gap was initially wide and the initial pool of available low-productivity Asian labour was enormous.

Potentially, the productivity gap between land in Africa and land in other regions is analogous to that gap in labour productivity. It may be an equilibrium which will persist for

many more decades. Alternatively, the new international commercial interest in the acquisition of African land may be the equivalent of the initial movement of industrial employment from Europe to Asia. If the two processes are parallel, the threshold at which land productivity in Africa begins to converge on the rest of the world has now been reached. However, as with Asian labour, the initial productivity gap is wide and the stock of low-productivity African land is immense so that convergence will take many decades.

There are, however, critically important differences between the spatial shift in demand for labour and the spatial shift in the demand for land. The industrial firms which pioneered the shift in employment from Europe to Asia hired a flow of services from Asian workers. In contrast, the agricultural firms which are pioneering the shift in demand for land to Africa are buying long leases, typically of 25 years or more. Asian workers who in 1980 accepted employment at a very low wage did not commit themselves to continue to work at that same wage for the next 25 years. As market wages rose foreign firms had to pay more to retain their local workforce. In contrast, if land is leased long term at a very low price subsequent increases in productivity accrue to the foreign firm, not the local landowner. And as with the relocation of manufacturing to Asia, even once convergence gets underway it will take a long time. Asian societies were able to capture the bulk of the benefits of convergence through continuous upwards revision of existing wages. In Africa, long leases hand the benefits of convergence to leaseholders.

This key difference implies that the purchaser of a long lease on land acquires not just whatever its current productivity might be, but an *option value* on its future productivity.[5] Supposing that the current productivity of the land is zero, its future productivity cannot fall below its current value: it may continue to be zero, or it may become positive. Hence, in this example, the only worth of the ownership rights in the land rests in its option value. In determining the appropriate price at which currently useless land should be sold, understanding what determines the option value is therefore fundamental. The option value of African land depends on discount rates and risk factors (including political risk), but above all the primary determinant is its future productivity. The productivity of land can increase both because of actions taken by pertinent actors, and because of events beyond their control: that is, change can be both endogenous and exogenous.

[5] We use 'productivity' to mean value productivity, not just physical productivity.

Exogenous Influences on the Option Value

The exogenous component of the option value is straightforward. The world price of agricultural output might rise because of global technical progress. For example, new crops such as bio-fuels might open up potential for land which otherwise has no use. The option value might also rise because of an increase in the global price of agricultural output due to rapid growth in demand, making all land more valuable. Of course, prices could also fall below their present level, but even if prices are as likely to fall as to rise, the effect of uncertainty about future prices on the option value is positive. At the worst, the option to cultivate the land can be left unexercised: the value of the option can drop to zero but it cannot turn negative. Hence, the greater the uncertainty as to future technologies and future prices the higher is the option value of the land. Exogenous changes in technology and prices can interact: if fuel prices increase then the development of bio-fuels becomes profitable, again raising the option value.

Two such exogenous influences explain much of the sudden international interest in the acquisition of African land. One key impetus was the spike in global food prices of 2008, and more particularly the response of the governments of many food exporting countries which was to ban food exports (Collier, 2008). The governments of several high-income food-importing countries, especially those that were autocracies, became concerned that during times of global food price spikes they could no longer rely upon being able to feed their populations through purchases on the world market. Food shortages have a long history of triggering violent protest against autocratic governments, and so they sought to develop an alternative means of emergency supply by acquiring agricultural land abroad the production from which could be pre-empted and withheld from the market as necessary. This produced a form of speculative demand for land driven by the prospect of occasional price spikes. A second impetus has been the trend of rising fossil fuel prices over the past decade. Here the speculation is not about occasional spikes in prices but their long-term levels. These two recent exogenous shocks account for a striking feature of the new international demand for African land. Whereas for the past century the commercialization of African agriculture has concentrated on the introduction of ‘cash’ crops such as coffee, tea, cocoa, sisal, and oil palm, the new demand is overwhelming to cultivate either food or bio-fuels. The new international demand for land is not acceleration in the existing process of commercialization but a radical new departure. Underpinning this new departure is the spectacular growth of Asia which,

because it is without historical precedent, has substantially increased uncertainty as to the future course of commodity prices and the technologies of their substitutes.

If land is abundant and its future productivity (and hence current option value) is subject to exogenous shocks, how should land sales be handled? To conceptualise the issues, we think of two time periods. In the first, the value of output produced by a unit of land is low, and there is only one investor. The investor is offered a lease on land at a specified rent that lasts for both periods and is not contingent on changes in land productivity. In the second period one of two things may happen. With probability $1 - \pi$ the productivity of land is unchanged and no further investors enter. Alternatively, with probability π the 'high' case occurs; the value of output produced by a unit of land jumps upwards and many new investors enter and bid for available land (i.e. land within the region that is not already leased to the first investor). In this latter case there is land scarcity and investor abundance, so abnormal profits are bid away and rents paid by new investors capture the full value for the government.

In this setting, what terms should be offered to the initial investor? The investor will formulate a demand curve for land, leasing more the lower is the rent. Government knows this as it chooses the level of rent it sets. Suppose first that $\pi = 0$, so there is no chance that the 'high' outcome will occur. Government might then set rent at the opportunity cost of land in its alternative use which may be very low, possibly zero, and let the investor take a correspondingly large area of land. This meets a criterion of economic efficiency – land will be leased up to the point where its productivity is equalised in the two alternative uses. However, it will in general leave profits with the investor. These should be taxed away, by a corporate profits tax or perhaps some 'royalty' on production. If it is not possible to set a high rate of corporate tax then government should set a higher rent, trading off the economic efficiency loss (the investor is taking less land than is efficient), with the government revenue earned. The actual levels of rent and of other tax that are set are likely to be the outcome of bargaining between the investor and government; the important point is that, with scarce investors and abundant land, rent alone will not transfer all the economic surplus to government.

If $\pi > 0$, so there is some (exogenous) chance that land productivity increases, then land has an option value to the investor, and also to government. For government, there is a value to waiting, since by restricting the amount of land released in the first period the government retains the option to lease more in the second period. Rent charged to the initial investor

should incorporate these values. The level of rent should be higher the greater is this probability, and the lower the discount rate (or sooner the anticipated increase in productivity). If the government and private investors both place equal value on the option and this value is captured in the rent then government is indifferent about the amount of available land that it allocates in the first period, rather than in the second. However, government will wish to hold back land for future release if there is a divergence of valuations between government and the marginal private investor. The government should release less land the lower is its discount rate relative to that of the investor, the more optimistic it is, and the less risk averse. Critically, investors may discount the option value by their perception of the political risk that, in the event of the high outcome, a future government will renege on commitments made by the current government. This high investor discount rate makes it appropriate for government to hold back a relatively large amount of land for future release.

Experience with oil and gas leases is relevant. Exploration blocks are typically released steadily over many years. This is partly to control the rate of resource depletion and smooth revenues, an argument relevant for non-renewables, not for land. But it is also partly to avoid the risk that putting large amounts on the market at the same time will depress prices, particularly if private investors perceive that projects have a high level of risk[6].

While this is the basic analysis, other policy dimensions and considerations are also important. Making the first period lease short is another possibility, but with the disadvantage of deterring long run investments. Contingent rents – having rent low in the first period and high in the second only if the 'high' state occurs – would be attractive if they could be implemented; in practise there is not a sharp or clearly verifiable dichotomy between high and low outcomes and writing any such contract would be difficult, increasing the scope for potential dispute and hence heightening rather than reducing political risk.

The essential message is that government should be forward looking, and recognise the possibility that land productivity and investor interest will increase. It should therefore limit initial sales and charge rents commensurate with this. There is also a case for using other tax instruments – such as a corporate profits tax – to capture a share of earnings made in excess of rents paid.

[6] For an overview of these issues see Humphreys, Sachs and Stiglitz 2007

Endogenous Influences on the Option Value:

Given the massive productivity gap in land, why is investor interest not much greater? Exogenous world factors – commodity prices and technology – are part of the answer, but local circumstances are probably the more important part. Poor local conditions can be attributed to a lack of the local public goods that influence land productivity, and these come in four main types. First, there may be lack of technical and agronomic knowledge. This is partly about which plant varieties are well-adapted to the local environment; partly about the sort of complementary investments that are needed to make land productive (e.g. the effectiveness of irrigation); and partly the consequence of a lack of investment (current and historical) in breeding plant varieties best suited to local conditions. Second, there may be a lack of infrastructure, including transport, power and other utilities, all of which are needed for high productivity. Third, there may be deficiencies of governance which create insecurity and political risk. Finally, there may be limited information about what works; this is a combination of technical knowledge (what plants grow best, what techniques of production to use), knowledge of local market conditions (principally that for labour), and knowledge of local institutions, politics, and practices. This information can only be acquired by practical experience of operation ('self-discovery') but once learnt, is observed by others; the knowledge is a public good and the demonstration effect is a positive externality.

All four of these public goods share two common features. One is that their supply is endogenous, depending on actions both by government and by investors. The other is that none of them is pan-African; to varying degrees they are all localized. Relevant information about agronomy is location specific as African agriculture is highly localized: for example, soil types are far more complex and variable than in most other regions and the disease vectors to which a crop might be susceptible cannot be known until it has been tried for several years. In respect of infrastructure, commercial agriculture is highly dependent upon transport logistics: rail, roads, airports and ports which are obviously location specific, and can usually not be supplied by a single investor acting alone. In respect of political risk, investors face country and region specific uncertainties that can only be resolved by time and experience. Demonstration effects too are likely to be region specific, as investors learn what works – in terms of agronomy, politics, and commercial practises – in particular regions.

The analogy with the dramatic increase in the productivity of Asian industrial labour is again helpful. We now understand why in 1980 industrial labour was radically less productive in Asia than in Europe, and why that productivity gap rapidly narrowed as employment relocated. Essentially, it was because of scale economies in industrial production which are external to the firm but are internalized within a spatial cluster such as a city.[7] The pioneering firms initially suffered low productivity because there were few other firms around them generating beneficial externalities such as a pool of trained labour and specialist services. As the pioneers demonstrated that despite these disadvantages they were profitable, further firms joined them increasing the scale of the cluster and raising the productivity of all the firms within it. The myriad decisions on which the emergence of the cluster depended – decisions to relocate, to train workers, and to establish specialist support services – were interdependent but uncoordinated. Had firms coordinated their decision to relocate, the shift in employment to low-wage Asia would have occurred earlier. As it was, the pioneering firms generated externalities.

This crucial feature of modern manufacturing applies, with some important differences, to the potential transformation of African agriculture. Whether commercial agriculture on currently underused African land becomes productive depends upon a wide range of decisions beyond the control of any one firm. Coordination issues arise in respect of agronomic knowledge, infrastructure, political risk and demonstration effects. There are differences, as economies of scale in a manufacturing cluster arise predominantly as the entry of firms expands the demand for inputs, leading to the emergence of labour skills and specialist services.[8] Although there is some such interdependence between firms in agriculture, many of the sources of interdependence are different - agronomic information, transport infrastructure, and political risk – and also involve government. Agronomic information is commonly generated by public research stations; roads and some other transport infrastructure are commonly provided by government, while the perceived level of political risk is largely within the control of the government. In agriculture, pioneering firms still generate externalities for other firms, but they are valuable partly because pioneer performance reveals to others what government is willing and able to do. Hence, potentially the government has more scope to address the coordination problem in agriculture than in manufacturing.

[7] For discussion of these mechanisms see Fujita et al 1999.

[8] See Duranton and Puga (2004) for analytical approaches and Rosenthal and Strange (2004) for empirics.

A second important difference is the degree to which pioneer investment is reversible. Cheap labour, the impetus for relocation, attracts labour-intensive manufacturing which by definition requires little capital investment. Further, if the enterprise fails much of this capital can be salvaged as the equipment is shipped abroad. Hence, once economic conditions make pioneering profitable, pioneer firms are likely to emerge without delay. In contrast, abundant land may be highly capital intensive, requiring substantial investment much of which will be sunk: for example, the preparation of previously uncultivated land is costly and this expenditure cannot be recovered if the enterprise fails. Since the cost of pioneer failure is higher in agriculture than in manufacturing, firms will be more cautious. Whereas a manufacturing firm might risk entry even if it anticipated that the most likely outcome was only modest operating profits, an agricultural firm may need the probability of substantial operating profits to offset the risk of large losses. If objectively profits for pioneers are modest, pioneers will be scarce.

3. Policies for the Transition to Land Scarcity

We have arrived at a series of crucial features of the entry of commercial agriculture into an initially land-abundant environment. First, the option value of land will be positive even when the objective return on it is currently very low or zero. Second, the option value has an exogenous component which appears to have been important in the recent take-off of demand. Third, the option value is endogenous to the provision of various public goods, starting with the authority to confer land rights. Fourth, as with manufacturing, pioneering firms generate externalities for subsequent potential entrants: this influences the option value of land as other firms learn from pioneers. Finally, unlike manufacturing, pioneering firms willing to make investments will be in short supply until objective conditions make them very profitable. We now turn to the policy implications of these features. How should a government manage the sale of leases and the future provision of public goods on land which is currently abundant because public goods are inadequate?

In answering this question we think of the unit of analysis as a ‘development region’ (or corridor) defined by the intersection of supplies of different public goods, and therefore as a contiguous territory having common governance, agronomy, and public goods. Given African heterogeneity – in terms of agronomic conditions, infrastructure access, and

governance – these regions might be quite small. Within the region government has a range of policy instruments: it can increase the productivity of land by providing public goods; it can set the terms of land contracts, including rent, scale, and work programmes; and it can provide taxes and subsidies on observable behaviour. These strategies can be made mutually reinforcing: localized public goods can be provided selectively, so that land is valuable within the development region, even if it remains abundant elsewhere. We consider the key public goods needed by a 'development region' in turn.

Experiment and Research

Africa's soils, crop disease vectors, and climatic conditions are highly localized. This calls for two related processes of discovery. One is selecting from the existing global stock of crops and varieties those which are best-suited to local agro-climatic conditions. The other is improving some existing variety so that it becomes better suited to local conditions. While there is enormous geographical variation, the same agronomic conditions might prevail in several non-contiguous areas, or cross governance boundaries, and so may span several 'development regions'.[9] Hence, it will not be efficient for such experimentation and research to be duplicated by the firms operating in each of these regions. There are then four possibilities.

One is to lease the rights to a mega-farm which encompasses an entire agro-climatic zone and so internalizes the externality of discovery. A second is to create marketable private rights to the discovery by patenting it. The third approach is to recognize that the pioneer investor who undertakes the discovery process generates an externality and to reward pioneers for it in some way. We return to this option below. The final approach is to supply the discovery through the public funding of agronomic research stations. If none of these approaches is followed, option values will be too low and there will be too few pioneers: pioneering would incur the uncompensated cost of generating a public good.

The creation of mega-farms has two considerable disadvantages. One is that the mega-farm will almost inevitably have monopsony power in the local labor market. This introduces inefficiency into labor allocation as the employer limits the amount of labor it hires in order to avoid raising the wage. Indeed, this was a notable problem in the large farms of the colonial era (Collier and Lal, 1986). Hence, greater efficiency in discovery would come at the

[9] The development region is the intersection of areas defined by shared agronomic, political and infrastructural features.

cost of reduced efficiency in employment. Another disadvantage of mega-farms is that they are so large as to be politically exposed. Inevitably they will generate opposition and this translates into political risks which are costs to the investor. Attempting to create marketable rights to research also encounters severe limits. The patent system is not designed to include matching-type discoveries (of the form 'this existing crop grows well here'), and its application to the development of new varieties is often limited.

Public provision through agronomic research stations has been the traditional route but since the 1980s agronomic research in Africa has been neglected, partly because other constraints upon output have been regarded as binding. Further, it has been focused on the smallholder sector which has very different needs from large-scale commercial agriculture. In the longer term substantially improving the public provision of research may be the best option, but it is seldom feasible in the short-term. Hence, in the short term the only practical solution to the research externality generated by pioneering is to provide a subsidy to pioneers. How this might be done we return to after considering the other public goods.

Infrastructure

Commercial agriculture needs ports, railways, roads, and airports, often with specialized facilities such as cold storage. Much of this is network infrastructure and so efficient provision requires common infrastructure for a large spatial area. Hence, as with discoveries, if each agricultural firm provides its own infrastructure at a smaller scale there will be much inefficient duplication.

As with research, there are four possible approaches. The scale of farming could be adjusted so as to internalize these public goods: that is, mega-farms. The services provided by the infrastructure could be marketed, whether by the pioneer or a third-party. The infrastructure could be provided by the government as a public good. Finally, the infrastructure provided by the pioneer investor could be subsidized.

Mega-farms are again unattractive: they address one economic problem but create two others (employment and risk). The next option is to create a market in infrastructure services so that the pioneer could subsequently charge new entrants for these services. The need for a pioneering agricultural firm to provide major transport infrastructure would dramatically change the economics of the project. Networked rail and ports require a huge initial investment which is irreversible. These characteristics make it highly unsuited for pioneer

commercial agriculture: in the event of failure the firm incurs large irrecoverable costs. Further, transport infrastructure is inherently characterized by scale-economies so that marginal cost is below average cost. Socially efficient pricing at marginal cost thus requires the operator to make a loss. In effect, pricing in this way the pioneer firm (which has to bear the fixed costs) would permanently subsidize its later-entry competitors. No firm would choose to be a pioneer with such conditions. Conventionally, the need for marginal cost pricing has constituted a case for public ownership. However, ports and railways are both very costly to build, and the services they provide are complex operations requiring a high level of organizational performance. Both these characteristics make them unsuited to public provision in the African context, although roads and possibly airports are better suited for public provision and for some commercial agriculture this may suffice.

For railways and ports this leaves subsidy as the only viable option. Fortunately, many African governments can provide a subsidy at no cost to themselves. High-value extractable minerals are scattered across Africa as point-resources. The extraction of these resources also requires railways and ports which can be financed from the rents from extraction which are far larger than those on agriculture. As long as these facilities are operated so as to be multifunction, servicing agriculture as well as resource extraction, agriculture need only pay the marginal cost of operation. While attractive, such multi-function infrastructure is organizationally demanding. For a mining company to run a rail service at marginal cost for farms would take it beyond its core competence: the service is liable to be mistrusted by farms because of its peripheral nature for the mining company and the potential for hold-up. For analogous reasons the subsidy cannot reasonably be conferred upon a pioneer commercial farm. Yet, for the reasons discussed above, having the government in operational control may also be unviable. Hence, a third-party commercial operator with core competence in infrastructure but with neither mining nor agricultural interests appears to be the most credible option as the recipient of the natural resource rent-financed subsidy.[10] The operator would need to be subject to restraints upon pricing. While the operator should be able to tap into the rents on mineral extraction to cover the fixed costs of the infrastructure it should not be able to subject the mining company to hold-up, and its pricing for commercial agriculture should be limited to marginal cost. For enforcement of these pricing objectives to be credible they may need to be supported by recourse to international arbitration.

[10] A benefit to resource extraction companies from such an arrangement is that the employment generated by commercial agriculture would create a stabilizing political constituency for the extraction process. Resource extraction itself generates little employment.

Demonstration Effects

Agricultural knowledge and infrastructure are necessary, but leave a great deal of residual uncertainty; there are too many unknowns for investors to be confident about how projects will turn out. Beyond the agro-climatic and infrastructure uncertainties, firms do not know what techniques of production will be effective, how easy it will be to obtain inputs, nor the political reaction, locally and nationally. The only way to find out is to try it, and the knowledge so obtained is a local public good: success or failure can be readily observed, and successful practice can be imitated by subsequent investors. In these circumstances the first mover creates a positive externality for later entrants, so no investor wants to be the first mover. This potentially creates a low level equilibrium in which everyone waits and no investment takes place.

As with the other public goods, a mega-farm is one solution to this problem, but again it creates other problems. The second approach of creating a market in the information so that the pioneer can sell it is infeasible because the information cannot be restricted. The third option of public provision is infeasible because the demonstration effect for other international commercial organizations requires that the entity undertaking the project itself be an international commercial organization. Hence, there remains a positive externality from the (successful) pioneer to later entrants; subsidy of pioneer investors for 'pilot' projects appears to be the best option.

Contracts for the transition

Above, we have suggested that both for the hard science of agro-climatic suitability and for the soft information that characterizes demonstration effects, there is a good case for public subsidy of pioneer investors. However, in Africa public subsidies have a poor record. They increase the potential for corruption, so that the cost of the subsidy can escalate without financing its intended purpose. Budget constraints can impede legitimate payments, so that promises of subsidies are discounted by risk.

Fortunately, there is a straightforward way of providing a pioneer subsidy that is affordable, credible, and incentive-compatible. The first mover should be permitted to acquire more land than he is required initially to use. This form of subsidy obviously creates the right incentives – the additional land has option value which increases if the pilot investment is a success.

Further, it has no current cost for the government although – in the event that the pilot succeeds – there will be foregone revenue from the sale of land that has appreciated in value.

How much land should the pioneer investor be allowed to acquire beyond that which he commits to cultivate in the near future? There is a trade-off between benefits and costs. The benefit reflects the need to attract the investor and create the incentive for a serious pilot project, the performance of which reveals the value of the land. This will involve allocating more land than will be used in early years as it constitutes the reward for the pioneer investment. The cost is that the government loses the right to land which, if the pilot is successful, will appreciate in value and could have been sold in the 'land scarce' regime

How many 'pioneer' investors should there be? We have emphasized that the spatial unit of application of these policies is formed by the intersection of supply of public goods in a development region. Each such region needs to have an appropriate supply of 'demonstration effect', the spatial range of which depends on the heterogeneity (political, economic, and agronomic) of the country. Even within a development region there is value to having several pioneer investors. The probability of at least one successful outcome increases with the number of independent pilots undertaken. However, there are costs of having too many pioneers. One is that they occupy more land, reducing the amount left for government to lease if the land-scarce regime is attained. The other is a free-rider problem between potential pioneers. Analogous to a gold rush, the profit-maximizing behaviour for a private investor is to acquire a lease and then wait for others to make the investments that increase its value. By licensing too many firms in the same development zone the government may switch the incentives from making pioneering investments to the speculative mode of watching and waiting. The government should therefore limit the initial number of firms that are allowed to set up in a development zone, relaxing the limit once potential has been demonstrated.

There are several further ways to deter speculation. One is pre-qualification, so investors have to demonstrate that they have the financial and technical competence to develop and cultivate the land. Another is to set a work plan, requiring those who acquire leases to cultivate a substantial proportion of the land forthwith. Yet there is risk that this condition would impede the proposed subsidy – the option to hold uncultivated land – that is being offered to pioneer investors. The problem is then that the government needs to determine the ratio of land on which cultivation is required to that which can be left uncultivated so that

there are sufficient pioneers for research and demonstration effects but not too many of them. One way to discover this ratio is to determine the appropriate (small) number of pioneer firms in a particular development region and then auction this number of licences with the bids competing on the ratio of cultivated land.[11]

Having set the rules, the government then needs to ensure that they are enforced. To an extent this is feasible by inspection of the characteristics of firms: those without a demonstrated capacity to operate a commercial farm can be excluded. However, this alone is insufficient: the same firm will behave differently according to the prevailing incentives. Even established firms whose core business is commercial farming will have an incentive to acquire land but not use it. Hence, analogous to mineral prospecting (Collier, 2010), the government will need to develop credible capacity to monitor whether firms are meeting their commitments to cultivate.

4. Conclusion: Implications for Current Policy Choices

The international demand for African agricultural land, having been effectively zero for several decades, since 2008 has been increasing rapidly. In responding to this new phenomenon we have suggested that African governments need to distinguish between two distinct types of demand: speculative and pioneering. Governments should be resisting speculative demand while encouraging pioneering demand.

Almost certainly the recent surge in demand is due to exogenous increases in the option value of land for future use in food production (in the event of a global price spike) and bio-fuels (in the event of continued increases in fuel prices). An implication is that much of this demand is essentially speculative: what buyers want is very long leases that can be left with only token use until circumstances change. Buyers are not motivated to cultivate immediately because the fundamentals of current commercial agricultural production remain heavily constrained by the absence of a wide range of public goods. Indeed, a characteristic feature of current demand, namely the desired vast scale of operation, is consistent with the expectation that even in favourable future circumstances of higher prices for output, these necessary

[11] Auctions for oil leases typically have pre-qualification and then bidding on multiple variables, including price, fiscal regime, and work plan. They typically have a condition that if the work plan is not executed within a given number of years the bid is forfeit.

supports will not be provided by others. Hence, buyers anticipate that in the event of production they will need to provide these services themselves so that the efficient scale of operation is enormous. This is why there is a demand for mega-farms.

However, while speculative mega-farms on long leases are now commercially attractive, it is not in Africa's interest to meet this demand. Governments are unlikely to be able to capture the full option value because of weak bargaining power and because the option values that investors are willing to pay are likely to be heavily discounted by political risk. Instead, government should focus on enhancing the endogenous determinants of the value of land. Africa needs to model its agricultural transition somewhat more closely on the Asian industrial transition. Asian governments provided public goods for manufacturing in localized areas through clustering, enabling the rents on differences in costs of production to accrue more rapidly to locals. The scope for doing this in respect of commercial agriculture is even greater than in industry because there is a greater need for high-cost infrastructure and bigger deficits in information. We have suggested that African governments should create land scarcity by localizing the provision of a range of public goods. Some of this provision would be directly by the state, some by piggybacking on the infrastructure investments financed by the rents from natural resource extraction, and some by subsidizing pioneering investors, although the subsidy can take the form of the allocation of land in excess of current utilization. We have suggested the need for sequence. The information and experience deficits are best addressed by attracting a few pioneer investors who are required to cultivate land within a specified timeframe. Such pioneers are valuable, conferring externalities on other investors, and so should be subsidized by being permitted to acquire more land that they commit to using. Only once these pioneers have generated the requisite information should the bulk of the land within the development region be opened up for leasing.

We have emphasised the fact that all the public goods discussed above are to varying degrees and for differing reasons, local. Agro-climatic information only has value in a specific agro-climatic zone. Transport infrastructure only has a specific spatial coverage. Demonstration effects only operate within a specific economic and political range. This makes clear the need for government to have a spatial strategy; the transition to land scarcity will not be achieved everywhere, but can be achieved in some regions. Transport infrastructure may determine these regions; it is often determined exogenously by history, or by the line of rail between point mineral resources and the port of evacuation. Other public goods can then be concentrated into a defined part of this area, namely a specific agro-ecological and political

zone which we have referred to as a 'development region'. By this means the abundance of underutilized African land can be converted to high-productivity land for which there is abundant investor demand.

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