Foreign Direct Investments in Africa's Farmlands: Threat or Opportunity for Local Populations ?

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Abstract:
We study the welfare effects of government-backed FDIs in Africa's farmlands. We build an occupational choice model featuring four mechanisms driving these effects. First, local farming is subject to social arrangements prescribing that farmers share their crop surplus with kin. Second, proceeds from land investment deals are invested to make modern inputs affordable to local farmers. Third, these deals cause some farmers to shift to wage employment. Fourth, they also entrench export-oriented agriculture, at the expense of local markets. We show that three conditions are sufficient for such deals to make local people better off: (i) the state has a high capacity and willingness to negotiate deals that benefit local people; (ii) these deals create enough jobs; (iii) wage employment make displaced farmers better off. Fulfilling these three conditions, however, may conflict with the interests of profit-maximizing foreign investors.

1. Introduction

We analyze the effects of international land investment deals on the well-being of people living in the targeted community, highlighting the mechanisms driving these effects. We develop a model of occupational choice under foreign direct investments (FDIs) in farmlands. Local farmers whose farmland is leased to foreign companies either use the remaining farmland to grow a subsistence crop or shift into wage employment as labourers of the foreign-owned company leasing their land. We model the effects of FDIs in farmlands on the well-being of local populations as resulting from an exogenous change in the quantity of local land leased to foreign investors.

Government-backed FDIs in Africa's farmlands is a fast growing phenomenon which raises concerns with respect to the welfare of local populations. Remarkably such investments deals target rural communities characterized by a quasi-subsistence livelihood and the occurrence of devastating episodes of famine and malnutrition, as recently observed in Ethiopia and Kenya in the horn of Africa. For a government who lacks the resources needed to induce farming modernization in rural communities, international acquisitions of local farmlands may become an attractive proposition. Indeed, many African governments have pursued or encouraged land investment deals with foreign entities. However, in 2008, a number of media sources including the *Financial Times* ran news reports about purported negotiations between the South Korean firm, Daewoo, and the government of Madagascar, regarding the lease of 1.3 million hectares of land in Western Madagascar to grow 5 million tons of maize annually by 2023 (Daniel and Mittal, 2009). News of this deal created a tremendous outcry in Madagascar, leading to civil unrest and violence, and sparking worldwide debate on international acquisition of farmlands in developing countries.

FDIs in farmlands—referred to as "land grabs" by their critics—are the purchase or lease of farmland by food-insecure nations and by private investors in poor countries for the purpose of securing their own food supplies and/or to produce biofuel (Daniel and

Mittal, 2009). According to the UN's *Food and Agricultural Organization* (FAO), FDIs in farmlands are rooted in a combination of factors, including the global food crisis of 2007 and 2008 that sparked sharp hikes in food prices worldwide, pressure from growing populations (particularly in Asia) and climate change. While most land-rich developing countries have been targeted, Africa is a particularly hot spot, attracting interest from investors from the likes of China, India, South Korea, Saudi Arabia and Qatar. Many African countries, including Sudan, Ethiopia, Madagascar, Mozambique and Somalia have become key recipients of FDI in land (Cotula et al., 2009). In Mozambique, for example, the World Bank estimates that the demand for farmland from foreign investors is more than twice the total quantity of land being cultivated in the country (Deininger and Songwe, 2009). In its 2011 Report[4], the US-based *Oakland Institute* reveals that "in 2009 alone nearly 60 million hectares—an area the size of France—was purchased or leased in Africa." In its 2011 Country Report for Ethiopia, the *Oakland Institute* also reveals that, since 2008, at least 3,619,509 hectares of land have been sold or leased to foreign investors. In its 2011 Country Report for Mali, the corresponding figure was 819,567 hectares of fertile land in 2010, much of which involves crops for biofuels. It is also reported that, although they oppose the deals, most local communities in Mali affected by foreign acquisition of peasants' farmland are forced to contend with serious disruptions and threats to their livelihoods due to a poor ability to organize socially (*Oakland Institute*, 2011). Drawing on these figures as well as on reports of social uprisings in some rural communities in Africa, critics of land investment deals suggest that a government that is acting in the best interests of its communities will not approve the sale or lease of farmlands to foreigners (Cotula et al., 2009). This view suggests that African governments that have negotiated or are negotiating land lease contracts with foreign investors may not be acting in the best interests of the threatened communities.

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[4]Available online at http://media.oaklandinstitute.org/press-release-understanding-land-investment-deals-africa

But there are not only critics of FDIs in Africa's farmlands. They also have supporters, including international organizations such as the *Food and Agriculture Organization* (FAO), the *International Fund for Agricultural Development* (IFAD) and the *International Food Policy Research Institute* (IFPRI). These supporters claim that, if properly conducted, FDIs in farmlands can only result in a win-win situation both for the investors and the targeted communities. There are three angles to their arguments. First, they argue that in Africa, large areas of suitable land are either unused or under-utilized, which means that leasing or selling them to foreign investors may not lead to massive displacement of peasants. Second, even if peasants are displaced, they may simply shift to wage employment, either directly with the foreign companies leasing their farmland, or indirectly through upstream and downstream linkages created by the land investment deals (FAO, 2009). Third, the induced commercialization of agriculture can usher in much needed transformation in local farming practices through technology transfer to local communities (FAO, 2009). But if FDIs in Africa's farmlands bring such opportunities to local communities as supporters claim, then why is there opposition (both tacit and active) to these deals in Africa?

Africa differs from other land–rich regions at least in three respects. First, its rural communities do not have legal tenure over the land they farm, and therefore in most cases cannot directly negotiate the land deals with foreign investors. Second, African countries generally lack well-established formal land markets, which makes it difficult to set land prices (Cotula et al., 2009). Third, Africa's rural communities are also a home for social arrangements that have adverse effects on the use of modern farming methods (Seavoy, 2000). For example, most parts of Africa have a culture of forced mutual help that presents farmers with a social obligation to share their surplus (if any) with less fortunate kin (Kazianga, 2006; Platteau, 2006; Alby and Auriol, 2011). Such social arrangements have been shown to hold back progress and innovation in rural activities (Seavoy, 2000), resulting in under-utilization of farmland. While the first two characteristics of rural Africa support the outcry against international acquisition of local farmland, the third one actually

suggests that there may be a role for land investment deals in the promotion of efficient use of farmland. Yet, with millions of hectares of farmland now under the firm ownership of food-insecure richer countries, the jury is still out on what is perceived as yet another episode in the global scramble over Africa's riches. At the center of this emerging debate are issues ranging from concerns for biodiversity, food security in Africa and the welfare of rural communities (Cotula et al., 2009).

In this paper, we restrict our focus on the welfare effects of FDIs in farmlands. Suppose that foreign investors are acting on behalf of a wealthy, but food-insecure, country, such that the primary reason for the investment is to secure its long term food security. Assume that such international investment deals reduce total farmland available to local farmers. This may either lead to the displacement of local farmers, or to the reduction in farm size, which critics of such deals argue are the culprit of their perceived unpopularity. Now, suppose that the government uses the proceeds from land investment deals to subsidize the costs to local farmers of modernizing their farming methods so as to increase acreage yields. Modernization may involve the use of commercial inputs such as seeds and fertilizers, as well as the building of locks and dams to improve the practice of irrigation farming. Such a move may mitigate the negative effect of a reduction in farm size. Furthermore, to the extent that FDIs in farmlands lead to job creations either directly or indirectly, displaced local farmers may shift into wage employment as their new source of livelihood. But displaced farmers would now need to purchase their food on the market. For their new livelihood to not make them worse off, their purchasing power must not be less than what they would have expected in the absence of land investment deals. However, their purchasing power also depends on food prices. If food prices are too high, perhaps due to global food insecurity, then land investment deals that displace local people may simply become a mechanism through which wealthy, but food-insecure, countries dump their food insecurity problems onto poor African countries. The win-win argument put forward by supporters of land investment deals therefore needs to be formally explained, so as to highlight the conditions

under which mutual gains can be realized.

The model we use to address this issue includes four important features. First, local subsistence farming is subject to social arrangements prescribing that farmers with a surplus (those who exert a high modernization effort) share their crop surplus with kin (Kazianga, 2006; Platteau, 2006; Alby and Auriol, 2011). Because of this social obligation, the individual level of modern inputs use may deviate from its socially optimal level.

Second, proceeds from land investment deals are invested to make high-quality seeds, fertilizers, and irrigation use affordable for local farmers. Some of these basic inputs are often beyond the means of smallholder African farmers. In a case study of Malawi, Fleshman (2008) reveals that fertilizer costs the equivalent of about $50 a bag, which may be too expensive for a smallholder African farmer, while buying it on credit may be too great a risk for farmers at the mercy of unreliable rains and poor-quality seeds. He also reveals that when in 2005 the government of Malawi began subsidizing fertilizers and high-yielding seeds for Malawi's smallholders, yields response was dramatic. With aid resources to Africa fast dwindling, this case study of Malawi suggests that using proceeds from international land investment deals to subsidize the costs of modernizing farming methods can indeed turn such deals into a win-win situation.

Third, FDIs in farmlands cause local peasants to shift into wage employment as their new source of livelihood. There is evidence that this feature of land investment deals is characteristic of land investment deals that target African rural communities (Daniel and Mittal, 2009; Oakland Institute, 2011). This reallocation of human resources can act as an indirect compensation mechanism, as it may stop international acquisition of local farmlands from reducing farm size among the local people who remain in a quasi-subsistence livelihood. By pulling some peasants out of subsistence farming, international acquisition of local farmland may reduce pressure on land availability, which may, in turn, increase output from subsistence farming. Like the other features of the model, reallocation of human resources provides yet another channel through which land investment deals can

be win-win.

Finally, FDIs in farmlands entrench export-oriented agriculture, causing displaced local farmers who shift to wage employment to become dependent on imported substitutes for the subsistence crop that they previously grew. This feature characterizes most existing land investment deals in Africa, where such deals target the acquisition of farmlands in communities that are most vulnerable to food crisis (Daniel and Mittal, 2009) for production of export crops including non-food agricultural commodities and biofuels (Daniel and Mittal, 2009; Cotula et al., 2009). Unlike the other three features of our model, therefore, this one provides a channel through which land investment deals may undermine the well-being of the local population, particularly in the context of a global food crisis characterized by rising food prices. We show that a model incorporating these four main features lends support to concerns about the proliferation of unregulated land investment deals in Africa—a continent that is a hotbed of food insecurity, as illustrated by frequent episodes of food crisis in Ethiopia, Kenya, Somalia, South Sudan and even Tunisia and Egypt. In particular, we identify three sufficient conditions for foreign acquisition of farmland to make local people better off: (i) The local government must have the capacity and willingness to negotiate lucrative land deals with foreign investors; (ii) land investment deals must create sufficient employment opportunities for displaced peasants, such as through adoption of labour-intensive technologies or significant backward and forward linkages; and (iii) displaced peasants who shift into wage employment must not face excessively high costs of living, such as in the form of high food prices. We then argue that fulfilling these three conditions, however, may conflict with the interests of profit-maximizing foreign investors.

To the best of our knowledge, our paper is the first theoretical analysis of the welfare implications of FDIs in Africa's farmlands, although many case studies of, and reports on, land investment deals exist (e.g., Deininger and Songwe, 2009; Daniel and Mittal, 2009; Cotula et al., 2009). For example, Deininger and Songwe (2009) outline the pillar of successful land investment deals, while warning that the modernization they may bring does

not necessarily improve the welfare of local people. Daniel and Mittal (2009) question the viability of the "win-win" argument that has been offered to quell concerns about land investment deals, by pointing to the gravity of the risks of removing the issue of food security for the world's poor from the forefront of the international debate. We build upon this literature by revealing the conditions that are sufficient for land investment deals to improve the experiences of local communities in which land is leased or purchased. In environments where these three conditions are not met, concerns about the well-being of local populations may be warranted. First, if regulations to implement these three conditions were to be put into place by the governments of targeted countries, claims that land investment deals are a win-win situation for both parties may be unrealistic. For example, the high prices for farmland required to adequately compensate local populations may discourage foreign investors. Furthermore, a regulation that makes the host nation's domestic food security the primary purpose of foreign acquisition of local farmlands may stand in conflict with foreign investors' vested interest in outsourcing food or biofuel production to their respective countries of origin, a strategy aimed at helping outsourcing countries escape the vagaries of prices on international markets (GRAIN, 2008). Last but not least, a regulation mandating the adoption of labour-intensive technologies by foreign investors may conflict with these investors' profit-maximizing objective, which again may reduce their interest in making deals with host nation governments. Our study thus cast doubts on the wisdom of the "win-win situation" put forward by supporters of foreign acquisitions of African farmlands, particularly when the targeted countries are themselves food-insecure (such as Ethiopia, South Sudan, Somalia and Madagascar) and given that foreign investors are private profit-oriented agents—not humanitarian aid-donors.

The remainder of the study is structured as follows. Section 2 describes the environment in which such investments occur. Section 3 discusses the welfare effects of these land deals. Finally, section 4 concludes the paper.

2. The Setup

Government-backed FDIs in farmlands is a fast growing phenomenon which raises concerns with respect to the welfare of local populations. In this section, we develop a framework to capture the potential effects of foreign acquisition of African farmlands and also highlight the mechanisms driving these effects.

Consider a rural community populated by a unit mass of ex-ante homogeneous agents, which we have referred to as peasants. The economy is endowed with a fixed stock of land, Z, which can be used to produce crops for either quasi-subsistence or commercial purposes. Land is the property of the state. The government allocates some of the land to peasants (N) for subsistence use (including farming, livestock herding, hunting or foraging) and leases part of it to a representative foreign firm (F), at a price, p_z, per unit of land leased. We assume that proceeds from farmland leased to the foreign firm are benevolently allocated to make high-quality seeds and fertilizers affordable for peasants so as to boost modern inputs use in farming.

Total farmland used by peasants is denoted by Z_N and total farmland leased or sold to the foreign firm is denoted by Z_F, with

$$Z_N + Z_F = Z. \tag{2.1}$$

Each peasant has a choice between subsistence farming ($s = 1$) and wage employment ($s = 0$) as their source of livelihood. Wage employment yields a wage, ω, which is used to purchase an imported substitute for the domestically grown subsistence crop.

For each peasant, the payoff of choosing occupation s in the presence of international land investments is given by his level of consumption $c(s)$:

$$V_s = c(s). \tag{2.2}$$

V_s denotes the quantity of food consumed when the peasant has occupation s:

$$c\left(s\right) = \begin{cases} c_m & \text{if } s = 0 \\ c_1 & \text{if } s = 1 \end{cases},$$

where c_m is the quantity of an imported substitute of the subsistence crop that is consumed when displaced peasants shift to wage employment as their new source of livelihood and c_1 denotes auto-consumption of subsistence output by a peasant involved in quasi-subsistence farming.

A peasant who chooses occupation $s = 0$, faces the following budget constraint for purchasing imported food:

$$p_m c_m \leq \omega, \tag{2.3}$$

where p_m denotes the relative price of the imported substitute and ω, the labor wage.

2.1. Quasi-Subsistence Livelihood

An important feature of this rural community is that peasants face social pressures to hold on to their harvested surplus, if any. We use β to denote the fraction of a peasant's harvest that he is able to protect from the social obligation to share his surplus with members of the community, including extended family members. To borrow the terminology used by Alby and Auriol (2011), one can think of $1 - \beta$ as a community or extended family tax.

A.1. Given his harvest, y, and the average harvest in the community, $\bar{y}$, the share of his own harvest that a peasant involved in quasi-subsistence farming is able to protect from the social obligation to share with kin, β, is strictly decreasing in his economic status within the community:

$$\beta = \left(\frac{\bar{y}}{y}\right)^{\varepsilon},$$

where $\varepsilon \in (0, 1)$ is an efficiency parameter.

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When $y/\bar{y} > 1$, the peasant with harvest y will be said to have harvested a surplus relative to his subsistence need, which is defined by the average crop harvest, $\bar{y}$. The peasant with a harvest of $y/\bar{y} < 1$ has a crop deficit and thus may receive handouts from the rest of the community, as a mutual help mechanism. Only when $y/\bar{y} = 1$ will a peasant be able to protect all his harvest from kin. Assumption $A.1$ states that having a harvest surplus relative to the community average exposes the peasant to social predation in the community, which creates a disincentive to exert a high farming modernization effort, in a sense we will make more precise below.

Production of the subsistence crop requires farmland, z, and a composite input in quantity e, denoting, for example, seeds and fertilizers. The level of harvest for a local subsistence farmer who uses a quantity e of a composite input on a farm of size z is thus:

$$y = z^{\alpha} e^{\gamma}, \tag{2.4}$$

where $\alpha + \gamma = 1$, with $\alpha, \gamma \in (0,1)$. We take the level of commercial input use, e, as a measure of local farmer's modernization effort.

A local farmer's level of auto-consumption thus is given by

$$c_1 = \beta y - p_e e, \tag{2.5}$$

where $p_e e$ denotes production costs, measured in units of subsistence good, and p_e, the exogenously given per unit cost.

Combining Assumption $A.1$ with (2.5), we obtain a typical farmer's level of auto-consumption as follows:

$$c_1 = \bar{y}^{\varepsilon} y^{1-\varepsilon} - p_e e. \tag{2.6}$$

In other words, the lower the average harvest, $\bar{y}$, the lower the level of auto-consumption for a typical local farmer.

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2.2. Optimal Use of Modern Inputs

As is the case in most rural societies, assume that all local farmers receive an equal plot of farmland (Seavoy, 2000), such that they face a land use constraint of $zn = Z_N$, where $n \in [0,1]$ denotes the total number of peasants involved in quasi-subsistence farming. We can then use (2.1) to obtain per capita farm size among local farmers as follows:

$$z = \frac{Z - Z_F}{n}, \tag{2.7}$$

where $Z - Z_F \equiv Z_N$. We can then combine (2.7) with (2.4) to obtain a typical local farmer's harvest as follows:

$$y = \left(\frac{Z - Z_F}{n}\right)^\alpha e^\gamma. \tag{2.8}$$

Since all local farmers are assumed to receive an equal amount of farmland, average crop harvest in the community is given by

$$\bar{y} = \left(\frac{Z - Z_F}{n}\right)^\alpha \bar{e}^\gamma, \tag{2.9}$$

where $\bar{e} > 0$ is the average farming modernization effort by local farmers as a whole. The average harvest in the community, $\bar{y}$, therefore embodies the subsistence farming norms embedded in $\bar{e}$, the average farming modernization effort in the community. Substituting (2.8) and (2.9) into (2.6) and rearranging yields a typical local farmer's auto-consumption level as follows:

$$c_1 = \left(\frac{Z - Z_F}{n}\right)^\alpha \bar{e}^{\varepsilon\gamma} e^{(1-\varepsilon)\gamma} - p_e e. \tag{2.10}$$

In other words, subsistence farming norms are an important determinant of local farmers' well-being. In particular, the average farming modernization effort within the local farming community, $\bar{e}$, and a farmer's own modernization effort, e, are strategic complements in his level of auto-consumption, c_1. Since $\bar{e}$ is set externally from a local farmer's point of view,

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his own modernization effort (as measured by the level of use of modern input) may be socially suboptimal. A question of interest is therefore whether international acquisition of local farmland that displaces some local farmers can correct for this externality.

To address this issue, assume that the government benevolently invests the proceeds from international acquisition of local farmland in the subsidization of the cost of modernizing local farming. More formally, let

$$p_e = \rho - \lambda p_z Z_F \qquad (2.11)$$

where $\rho > 0$ denotes the status quo per unit cost level, λ is a positive scale operator measuring the efficiency of public investment, $p_z Z_F$, in the reduction of farming modernization costs. To ensure that prices are always non-negative, we assume that

$$\rho - \lambda p_z Z \geq 0.$$

This feature of the cost of farming modernization provides a channel through which international acquisition of local farmland can improve the lives of local farmers. We will return to this issue further below.

2.3. The Foreign-Owned Company

The representative foreign-owned company produces a cash crop solely for export using rented capital, K_F, leased or purchased farmland, Z_F, and hired labor, L_F. The cash crop is produced according to the following Cobb-Douglas function:

$$Y_F = Z_F^\alpha L_F^\eta K_F^\kappa, \qquad (2.12)$$

where α, β and κ are factor shares satisfying the constant return to scale condition $\alpha + \eta + \kappa = 1$, with $\alpha, \eta, \kappa \in (0, 1)$. The labour input constraint is given by

$$L_F \leq 1 - n, \tag{2.13}$$

where $1 - n$ denotes the total number of displaced peasants who shift to wage employment as their new source of livelihood. Under perfect competition, the foreign-owned company pays a market-clearing wage of

$$\omega = \eta p_F Z_F^\alpha K_F^\kappa (1 - n)^{\eta - 1} \tag{2.14}$$

to labourers and rents an amount of capital, K_F, that solves the following equation:

$$r = \kappa Z_F^\alpha L_F^\eta K_F^{\kappa - 1}.$$

At the end of this process, the foreign company claims a surplus of

$$\pi_F = (1 - \kappa - \eta) Z_F^\alpha L_F^\eta K_F^\kappa - p_z Z_F. \tag{2.15}$$

As the foreign-owned company is a price-taker in capital markets,[5] the optimal level of capital used is given by

$$K_F = \left[\frac{\kappa Z_F^\alpha (1 - n)^\eta}{r} \right]^{\frac{1}{1 - \kappa}}. \tag{2.16}$$

Substituting (2.16) into (2.14) gives the following market-clearing wage:

$$\omega = \eta (1 - n)^{-\left(\frac{1 - \kappa - \eta}{1 - \kappa}\right)} \left(\frac{\kappa}{r}\right)^{\frac{\kappa}{1 - \kappa}} Z_F^{\frac{\alpha}{1 - \kappa}}. \tag{2.17}$$

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[5]This is likely to be the case, when the foreign firm borrows on international markets.

Clearly, foreign acquisition of peasants' land (i.e., an exogenous increase in Z_F) tends to raise the wage rate received by displaced peasants who are employed as labourers in the foreign-owned company, although the magnitude of this effect depends on the labour share among production inputs, η. For example, if production described by this function is highly capital-intensive, the labour share will be relatively small, and the wage effect of foreign acquisition of peasants' farmland may be negligible. In this context, there will be little induced reallocation of peasants from subsistence activities to wage employment, with the result that average farm size in the community decreases.

But the positive effects of foreign land acquisition do not only operate through the reallocation of labour. They may also arise through a change in peasants' labour effort in subsistence farming, as we show below.

2.4. FDIs in Farmlands and Local Farmers' Use of Modern Inputs

How does international acquisition of local farmland affect a peasant's farming modernization effort? To address this question, we first compute the payoff of a peasant involved in subsistence farming. We then combine (2.2) with (2.3), and (2.10) to get the following payoff:

$$V_1\left(e, \bar{e}, n, Z_F\right) = \bar{e}^{\varepsilon\gamma} e^{(1-\varepsilon)\gamma} \left(\frac{Z - Z_F}{n}\right)^{\alpha} - p_e e. \tag{2.18}$$

Observe from (2.18) that international acquisition of local farmland has two effects on the payoff of subsistence farming. On the one hand, it tends to reduce farmland available to local people (the term $\frac{Z-Z_F}{n}$). On the other hand, it reduces the marginal cost of exerting a high farming effort (the term p_e as defined in (2.11)). Which of these two effects dominates determines the net effect that international acquisition of local farmland has on the optimal farming effort chosen by a typical local farmer, as we show below.

A typical peasant's problem is thus to choose their effort, e, to solve

$$\max_e V_1\left(e, \bar{e}, n, Z_F\right).$$

For an interior solution, this maximization problem can be written as follows, using (2.7):

$$e = \bar{e}^{\varepsilon\gamma/\mu}\left[\frac{\gamma\left(1-\varepsilon\right)}{p_e}\left(\frac{Z-Z_F}{n}\right)^\alpha\right]^{\frac{1}{\mu}}, \tag{2.19}$$

where $\mu = 1 - \left(1-\varepsilon\right)\gamma$. The following effects can thus be derived from (2.19):

Proposition 1. *(i) A local farmer's modernization effort decreases with the size of the population of the peasant community, n: $\partial e/\partial n < 0$.*

(ii) It rises with an exogenous increase in the average modernization effort in the rural community: $\partial e/\partial \bar{e} > 0$.

(iii) International acquisition of local farmland (i.e., an exogenous increase in Z_F) has an ambiguous effect on a local farmer's modernization effort:

$\partial e/\partial Z_F > 0$, if

$$p_z > \frac{\alpha\lambda^{-1}p_e}{Z-Z_F} \tag{2.20}$$

and $\partial e/\partial Z_F < 0$, if

$$p_z < \frac{\alpha\lambda^{-1}p_e}{Z-Z_F}. \tag{2.21}$$

Proposition 1-(i) is a direct implication of the production technology being constant-to-return to scale in land and the composite modern input, as shown in (2.8). Proposition 1-(ii) suggests that subsistence farming norms that lower the average farming modernization effort adversely affect peasants' well-being, in the sense that they tend to discourage effort to modernize farming through the use of modern inputs such as high-yielding seeds and fertilizers. The social obligation to share any crop surplus with other members of the peasant community discourages such effort because it suggests that accumulating a harvested surplus is pointless, and will face a punitive community tax of $1 - \beta$. Proposition

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1-(iii) thus suggests that land leases to foreigners by a benevolent government, if well nego-tiated as per condition (2.20), can counter the adverse effects of subsistence farming norms that impede high modernization effort. Only when land leases to foreigners are poorly negotiated, as described by (2.21), will the leases reduce farmers' use of modern inputs.

3. The Welfare Effects of FDIs in Farmlands

In this section, we analyze the welfare effects of FDIs in farmlands, highlighting the mech-anisms that drive these effects. Recall that the level of use of modern input by a typical peasant in this environment is assumed to be positively related to the average level of mod-ern input use in the peasant community. To the extent that foreign acquisition of peasants' farmland is compensated by subsidization programs that reduce the costs of modernizing farming practices, such an externality can be countered, thereby nudging the level of farm-ing modernization towards its socially optimal level. This effect on farming practices is one of the rationales for foreign acquisition of peasants' farmland. A second rationale involves the labour market, as international acquisition of local farmland displaces some farmers, pushing them into wage employment as hired labourers in the foreign-owned company. This reallocation of human resources away from subsistence farming can, depending upon its magnitude, ease the pressure on farmland caused by international acquisition of local farmland.

Taken individually, however, each of these two rationales can be undermined by any of the following issues. In relation to any prospective reduction in the cost of modernizing subsistence farming, we should consider the compensation that comes in the form of the subsidization of commercial inputs. A problem can arise if the government is not account-able to the peasant community, in which case the compensation may not be received in full. Even if the government were to act benevolently, such that all the proceeds from leasing farmland to the foreign-owned company are totally invested in the subsidization of

commercial inputs used by subsistence farmers, there is also the question of whether the government has the capacity to negotiate adequate compensation with the foreign-owned company. The potentially negative outcome is that the compensation received will be too small to have any significant impact on peasants' livelihoods.

We can also consider the displacement of local farmers induced by foreign acquisition of local farmland. We assume that displaced farmers shift into wage employment. There is no problem in this regard if the production process adopted by the foreign-owned company is labour-intensive. If this process is either capital-intensive, or creates few backward and forward linkages, then the potential for job creation may be negligible: this could result in a more than proportional reduction in farm size in the peasant community. Below, we provide an analysis of these rationales, keeping track of the related potential problems.

3.1. FDIs in Farmlands and the Payoff to Subsistence Farming

In this subsection, we discuss the effects of international acquisition of local farmland on the payoff to subsistence farming. At this stage, it is important to note that since peasants are presumed identical, in equilibrium, if one peasant obeys the subsistence farming norm, $\bar{e}$, all of them will obey it, thus leading to an identical effort level of $e = \bar{e}$. Therefore, on the basis of (2.19), and making use of (2.11), we obtain the equilibrium level of farming modernization effort as follows:

$$e = \left[\frac{\gamma (1 - \varepsilon)}{\rho - \lambda p_z Z_F} \right]^{-\alpha} \left(\frac{Z - Z_F}{n} \right), \tag{3.1}$$

since $1 - \gamma = \alpha$. With the determination of the equilibrium level of farming modernization effort, we can now compute the equilibrium payoff to a peasant who makes the occupation decision $s = 1$, by substituting the equilibrium effort level back into (2.18), and re-arranging terms:

$$\bar{V}_1 (n, p_z, Z_F) = [1 - \gamma (1 - \varepsilon)] \left[\frac{\gamma (1 - \varepsilon)}{\rho - \lambda p_z Z_F} \right]^{\frac{\gamma}{1-\gamma}} \left(\frac{Z - Z_F}{n} \right). \tag{3.2}$$

Expression (3.2) shows that international acquisition of peasants' farmland has two opposite effects on a typical peasant's welfare. First, there is a negative effect from the reduction in per capita farmland, $z = \dfrac{Z - Z_F}{n}$, used to grow the subsistence crop. Second, there is a positive effect due to the fact that proceeds from international land investment deals are invested in the reduction of the cost of modernizing subsistence farming.

Differentiating (3.2), it can be established that

$$\frac{\partial \bar{V}_1 \left(n, p_z, Z_F\right)}{\partial Z_F} = \left[\frac{\gamma \lambda p_z}{\alpha p_e} - \frac{1}{Z - Z_F}\right] \bar{V}_1 \left(n, p_z, Z_F\right).$$

On the other hand, it follows from (3.2) that

$$\frac{\partial \bar{V}_1 \left(n, p_z, Z_F\right)}{\partial n} < 0.$$

We have just established the following proposition

Proposition 2. *The payoff to a subsistence farmer is lower, the larger the population of such farmers, n. Furthermore, international land investment deals (i.e., an increase in Z_F) raises this payoff if condition (2.20) holds, and reduces it if condition (2.21) holds instead.*

The first part of Proposition 2 is an implication of Proposition 1-(i) which suggests that smallholder farmers tend to practice low input agriculture. This results in a low payoff. The second part of Proposition 2 suggests that unless the government can negotiate a sufficiently high land price, p_z, international acquisition of local farmland is most likely to reduce the payoff of remaining a subsistence farmer. This low payoff, in turn, may push some peasants out of subsistence farming and into wage employment— as labourers in the foreign-owned company that is leasing some of their farmland. Such a reallocation of peasants across occupations may, in turn, mitigate the tendency of international acquisition of local to cause a reduction in farm size in the peasant community. Arguably, for this to happen, the foreign-owned company's production operations must be sufficiently labour-intensive,

as we show further below.

3.2. FDIs in Farmlands and the Payoff to Wage-Employment

Recall that in the presence of international acquisition of local farmland, peasants initially in unit mass have the option to pursue two different occupations: Subsistence farming or wage employment. A peasant who elects to supply labour earns a wage, ω, and uses it to finance consumption of an imported substitute. Using (2.2), (2.3) and (2.17), we can write the utility payoff associated with this occupational strategy as follows:

$$V_0 (n, p_m, Z_F) = \frac{\eta}{p_m} (1 - n)^{-\varsigma} \left(\frac{\kappa}{r} \right)^{\frac{\kappa}{1-\kappa}} Z_F^{\frac{\alpha}{1-\kappa}}, \tag{3.3}$$

where

$$\varsigma = \frac{1 - \kappa - \eta}{1 - \kappa}$$

is as found in (2.17). The following Proposition thus can be established by differentiation of expression (3.3).

Proposition 3. *International land investment deals (i.e., an increase in Z_F) raises the payoff to wage employment, as does an increase in the number of subsistence farmers, n. However, high food prices (an increase in p_m) reduce it.*

Both of these results can be easily expected because both n and Z_F affect the wage received by laborers. With both Propositions 2 and 3 in hand, we can now proceed to determine the equilibrium allocation of the peasant community's human resources across activities (subsistence farming and wage employment). We undertake this task below.

3.3. Equilibrium Effects of FDIs in Farmlands

When the situation is described by (n, p_m, p_z, Z_F), a peasant will choose to remain in the community and undertake subsistence farming if and only if the associated utility payoff

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exceeds the utility payoff from wage employment:

$$\bar{V}_1\left(n, p_z, Z_F\right) > V_0\left(n, p_m, Z_F\right).$$

The peasant will choose to leave subsistence farming and become a labourer in the foreign-owned company if and only if

$$\bar{V}_1\left(n, p_z, Z_F\right) < V_0\left(n, p_m, Z_F\right).$$

Peasants are indifferent as to which occupation they will pursue if

$$\bar{V}_1\left(n, p_z, Z_F\right) = V_0\left(n, p_m, Z_F\right).$$

Figure 1 below illustrates the existence of the equilibrium, as characterized by the size of the peasant community after foreign acquisition of local farmland, n^*. This equilibrium occurs at point A in figure 1, when the downward-sloping curve intersects with the upward-sloping
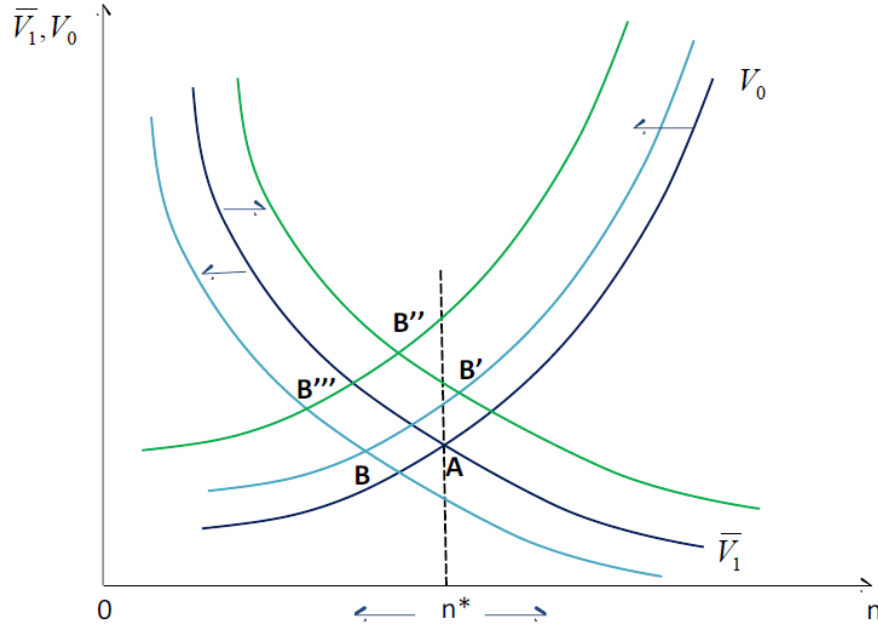
curve.

Figure 1. The effects of land investment deals on the size of the

peasant community, n

The downward-sloping curves represent the payoff of engaging of a subsistence farmer, $\bar{V}_1$, as a function of the size of the peasant community, n, a for a given level of Z_F. These curves are drawn on the basis of Proposition 2. The upward-sloping curves represent the payoff from wage employment, V_0, also as a function of the size of the peasant community, n, and for a given level of Z_F. These curves are based on Proposition 3. Point A then gives the equilibrium size of the peasant community, corresponding to the intersection between the original down-sloping curve and the original upward-sloping curve. An interesting question therefore arises: How does a change in the quantity of local farmland leased to the foreign-owned company, Z_F, affect the equilibrium size of the peasant community, n^*? Since both $\bar{V}_1$ and V_0 depend on Z_F, an exogenous change in Z_F will prompt a shift of both the downward-sloping and upward-sloping curves represented in figure 1. As per Proposition 2, the effect of a change in Z_F on the original downward-sloping curve representing the

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function $\bar{V}_1$ is ambiguous. This curve may either shift down and to the left (the downward-sloping light-blue curve in figure 1) or up and to the right (the downward-sloping green curve in figure 1). By contrast, on the basis of Proposition 3, the effect of a change in Z_F on the upward-sloping curve that represents the function V_0 is non-ambiguous: It shifts this curve up and to the left, as shown in figure 1. Depending on the magnitude of this shift, the equilibrium size of the peasant community may decline (point B, B'', or B''' in figure 1), or it may not (point B' in figure 1). In order to further clarify the effect of foreign acquisition of peasants' farmland on the equilibrium size of the peasant community, we complement the above geometric analysis with a comparative statics analysis so as to highlight the determinants of the extent to which international acquisition of local farmland shifts the original upward-sloping curve:

Let $\Gamma\left(n, p_m, p_z, Z_F\right) = \bar{V}_1\left(n, p_z, Z_F\right) - V_0\left(n, p_m, Z_F\right)$ express the net gain from engaging in subsistence farming. Taking the partial derivative of the function $\Gamma\left(.\right)$ with respect to Z_F yields:

$$\Gamma_{Z_F} = \frac{\partial \bar{V}_1\left(n, p_z, Z_F\right)}{\partial Z_F} - \frac{\partial V_0\left(n, p_m, Z_F\right)}{\partial Z_F},$$

where $\Gamma_{Z_F} \equiv \partial \Gamma\left(n, p, p_z, Z_F\right) / \partial Z_F$. In other words, Γ_{Z_F} is the algebraic sum of two effects and may thus be either positive or negative. On the one hand, Proposition 2 states that the sign of the term

$$\frac{\partial \bar{V}_1\left(n, p_z, Z_F\right)}{\partial Z_F} = \left[\frac{\gamma \lambda p_z}{\alpha p_e} - \frac{1}{Z - Z_F}\right] \bar{V}_1\left(n, p_z, Z_F\right) \tag{3.4}$$

is ambiguous. If condition (2.21) holds, then the original downward-sloping curve shifts down and to the left as in figure 1. In that case, from Proposition 3, the term

$$\frac{\partial V_0\left(n, p_m, Z_F\right)}{\partial Z_F} = \frac{\alpha}{\left(1 - \kappa\right) Z_F} V_0\left(n, p_m, Z_F\right) \tag{3.5}$$

is strictly positive. This means that the net effect, Γ_{Z_F}, will be unambiguously negative:

$\Gamma_{Z_F} < 0.$

If condition (2.20) holds instead, the term in (3.4) will be strictly positive. In figure 1, this corresponds to the shift of the downward-sloping dark-blue curve up and to the right. In this case, the sign of the net effect, Γ_{Z_F}, is ambiguous. This sign depends on the magnitude of the effect seen in (3.5). This same term also illustrates that the magnitude of this effect depends on the η/p_m ratio. The term η denotes the labor share in the production process used by the foreign company, while p_m denotes the relative price of the imported substitute for the local subsistence crop. The higher the η/p_m ratio, the greater the benefit of foreign acquisition of local farmland in terms of wage employment. This ratio is higher either when the foreign-owned company adopts a sufficiently labour-intensive technology (i.e., η is sufficiently high for a given p_m), or when the imported substitute for the domestic subsistence good is relatively cheap (i.e., p_m is sufficiently low for a given η). When this is the case, international acquisition of local farmland will cause comparatively more peasants to shift from subsistence farming to wage employment as their new source of livelihood, with the result that $\Gamma_{Z_F} < 0$. The following lemma has hereby been established:

Lemma 1. *The function $\Gamma(.)$ has the following properties:*

(i) $\Gamma_n < 0$;

(ii) $\Gamma_{p_m} > 0$;

(iii) $\Gamma_{p_z} > 0$

(iv) $\Gamma_{Z_F} < 0$, either if condition (2.21) holds or if η/p_m is sufficiently high.

Since wages adjust, local people will continue to change occupations until the net payoff of doing so is zero:

$$\Gamma(n, p_m, p_z, Z_F) = 0. \tag{3.6}$$

Therefore, the equilibrium size of the peasant community, n^*, solves equation (3.6). On the basis of lemma 1, the implicit function theorem may be applied to obtain the properties

of the function representing n^*:

$$n^* = N\left(p_m, p_z, Z_F\right). \tag{3.7}$$

Proposition 4. *If condition (2.21) is fulfilled, or if η/p_m is sufficiently high, then international acquisition of local farmland induce a shift to wage employment (i.e., $\partial n^*/\partial Z_F < 0$), whereas a high cost of living (as determined by the relative price of the imported good, p_m) increases it (i.e., $\partial n^*/\partial p_m > 0$).*

With proposition 4 in hand, we can now properly begin our investigation of the welfare effects of international acquisition of local farmland.

3.4. FDIs in Farmlands and the Welfare of Local Populations

In this subsection, we analyze the effects of FDIs in farmlands on the economic well-being of local populations (including subsistence farmers and wage earners). Since, in equilibrium, peasants and wage earners achieve the same level of utility irrespective of their occupational choice (otherwise peasants would continue to move from the low-utility occupation to the high-utility one), we can use (3.6) and (3.7) to rewrite this shared utility payoff as follows:

$$\hat{V}\left(p_m, p_z, Z_F\right) = \left[1 - \gamma\left(1 - \varepsilon\right)\right] \left[\frac{\gamma\left(1 - \varepsilon\right)}{\rho - \lambda p_z Z_F}\right]^{\frac{\gamma}{1-\gamma}} \left[\frac{Z - Z_F}{N\left(p_m, p_z, Z_F\right)}\right], \tag{3.8}$$

where $\hat{V}\left(p_m, p_z, Z_F\right) \equiv \bar{V}_1\left[N\left(p_m, p_z, Z_F\right), p_z, Z_F\right]$. The effect of international land investment deals on community members' welfare can therefore be characterized by the partial derivative of the function $\hat{V}\left(p_m, p_z, .\right)$ with respect to Z_F:

$$\frac{\partial \hat{V}\left(p_m, p_z, Z_F\right)}{\partial Z_F} = \frac{\partial \bar{V}_1\left[N\left(p_m, p_z, Z_F\right), p_z, Z_F\right]}{\partial Z_F} + \frac{\partial \bar{V}_1\left(\left[N\left(p_m, p_z, Z_F\right), p_z, Z_F\right]\right)}{\partial n^*}\frac{\partial n^*}{\partial Z_F}. \tag{3.9}$$

We know from lemma 1 and from proposition 4 that

$$\frac{\partial \bar{V}_1 \left([N\left(p, p_z, Z_F\right), p_z, Z_F] \right)}{\partial n^*} \frac{\partial n^*}{\partial Z_F} > 0 \qquad (3.10)$$

if the η/p_m ratio is sufficiently high. However, as shown in Proposition 2, the sign of the first term on the right-hand side of (3.9) is ambiguous, and depends on the land price, p_z. A lower p_z may reflect either the government's inability to negotiate adequate compensation for farmland leased to the foreign company or public sector corruption due to lack of transparency and accountability, and would lead to

$$\frac{\partial \bar{V}_1 \left[N\left(p_m, p_z, Z_F\right), p_z, Z_F\right]}{\partial Z_F} < 0, \qquad (3.11)$$

while the reverse would hold in the presence of strong state capacity and sound institutional transparency and accountability.

Observe that even if the inequality in (3.11) holds, the sign of $\dfrac{\partial \hat{V}\left(p_m, p_z, Z_F\right)}{\partial Z_F}$ is still positive if the η/p_m ratio is large enough to offset the negative effect in (3.11). Likewise, even if the inequality in (3.10) were to be violated, the sign of $\dfrac{\partial \hat{V}\left(p_m, p_z, Z_F\right)}{\partial Z_F}$ is still positive if the price of land, p_z, is large enough for the positive effect,

$$\frac{\partial \bar{V}_1 \left[N\left(p_m, p_z, Z_F\right), p_z, Z_F\right]}{\partial Z_F} > 0,$$

to offset the non-positive effect,

$$\frac{\partial \bar{V}_1 \left([N\left(p_m, p_z, Z_F\right), p_z, Z_F] \right)}{\partial n^*} \frac{\partial n^*}{\partial Z_F} \leq 0.$$

We have just established the sufficient conditions for land investment deals to improve the welfare of local populations:

Proposition 5. *If condition (2.20) hold, and if the η/p_m ratio is also sufficiently high,*

then land investment deals raise the welfare of the local population.

In other words, international land investment deals—whereby a host nation's government takes farmland from local people to lease or sell to foreign countries or companies—will improve local people's welfare if: Land investment deals create enough jobs (i.e., if η is sufficiently high) or if the living costs of adopting wage employment as a source of livelihood are sufficiently low (i.e., if p is sufficiently low), and in either of these cases state capacity must be strong and governance and institutions for accountability must be sound (satisfying condition (2.20)).

The welfare effects of FDIs in farmlands operate through three different channels. First, such deals can counter the adverse effects of traditional subsistence farming norms that suppress individual effort among local peasants, so long as the government can secure sufficiently lucrative deals, and use the proceed to boost local farmers' use of modern inputs. Second, they create job opportunities for local people, and can induce a welfare-enhancing transition of local people out of quasi-subsistence livelihoods and into modern livelihoods characterized by wage employment. This is likely to be the case when foreign companies adopt labour-intensive technologies and/or their activities generate sufficient upstream and downstream linkages leading to new and rewarding employment opportunities for local people. Third, they entrech export-oriented agriculture, and thus cause displaced farmers who shifted to wage employment to become dependent on food imports for consumption. This is likely to be the case if land investment deals are primarily designed to satisfy the interests of foreign countries, as is assumed in this paper. So long as the price of food imports is sufficiently low, this may provide a third mechanism through which land investment deals improve welfare in the local community.

The above analysis thus points to three factors which are likely to explain opposition to land investment deals in Africa: (i) The domestic government lacks the capacity and willingness to negotiate lucrative land deals with foreign investors; (ii) the government is corrupt or unaccountable to the targeted local communities; and (iii) the living costs

of shifting from subsistence livelihoods to modern livelihoods characterized by wage employment are too high. The third condition is particularly likely in view of the fact that international

land investment deals have taken place in the context of global food crisis, characterized by rising food prices. For poor countries which are already food-insecure, dependence on international markets for food (as induced by foreign acquisition of peasants' farmland) runs the risk of exacerbating food insecurity in countries where such deals are made.

4. Conclusion

We studied the welfare effects of FDIs in farmlands. We highlighted four specific mechanisms driving these effects. First, subsistence farming takes place in a context where the culture of forced mutual help effectively amounts to a community tax on peasants who obtain a harvest surplus through the use of modern farm inputs. This community tax stems from the social obligation to share their harvested surplus with less fortunate kin. The social pressure created by this informal arrangement entrenches a subsistence farming norm where no peasant has an incentive to modernizing subsistence farming.

Second, farmland leased or sold to profit-oriented foreign companies generates public funds that are invested in the subsidization of the costs of modernizing subsistence farming. This may include subsidies on fertilizer and high-yielding seeds, as well as the construction of locks and dams to encourage the practice of irrigation farming. This feature of the model provides a role for international acquisition of local farmland to promote the use of modern inputs by local farmers.

Third, peasants displaced by international acquisition of local farmland shift to wage employment as employees in foreign-owned companies. How rewarding this transition is depends directly on the magnitude of job opportunities created by these land deals. In particular, the degree of labour-intensity of the technology adopted by the foreign-

owned company is a constraint on peasants' shift to wage employment. The shift to wage employment is greater when the foreign-owned company uses a more labour-intensive technology.

Finally, farmland leased or sold to foreign investors is used solely to grow an export crop, thus entrenching export-oriented agriculture as a feature of international land investment deals. As a result, displaced farmers who shift to wage employment become dependent on imports that substitute for the subsistence crop they previously grew in their community. They must finance imports of this substitute with their labour earnings. The cost of living associated with this new livelihood introduces a channel through which land investment deals may reduce welfare among local population, particularly in the context of a global food crisis. When the price of imported food is too high, the welfare of displaced peasants decreases, causing them to retreat to subsistence livelihoods. Only when the price of imports is sufficiently low will the situation of displaced peasants improve with this transition to wage employment.

We show that a model that incorporates these features can help identify sufficient conditions for foreign acquisition of Africa's farmlands to make local populations better off: (i) State capacity and willingness to negotiate land investment deals that benefit local populations must be sufficiently high; (ii) there must be sufficient sources of alternative livelihoods for displaced farmers; and (iii) the shift to wage employment must make displaced peasants better off compared to pre-FDIs subsistence livelihood.

Condition (iii) may be obtained by regulations prescribing that the domestic market becomes the primary focus of land investment deals, while condition (ii) can be guaranteed by regulations prescribing the use of labour-intensive technologies, so as to absorb the rural labour surplus. However, on the one hand, regulations supporting the realization of conditions (ii) and (iii) may be difficult to pass if the political and institutional reforms needed to support condition (i) are not passed first. If these regulations and reforms could be put into place before negotiating with foreign countries and companies for the

lease or sale of farmlands, local communities targeted by international acquisition of local farmlands could indeed be made better off. On the other hand, it remains to be seen if regulations that ensure that conditions (i), (ii), and (iii) are fulfilled in targeted countries also maximize the profit of foreign investors. In the affirmative, a win-win situation may indeed occur. But existing facts on international acquisition of local farmlands are not encouraging in this regard. In particular, countries involved in the acquisition of African farmlands, namely Bahrain, China, Egypt, India, Japan, Jordan, Kuwait, Libya, Malaysia, South Korea, Qatar, Saudi Arabia and the United Arab Emirates, all have a vested interest in outsourcing their own food security in order to escape high food prices (GRAIN, 2008). Arguably, for foreign investors, profit may be maximized by entrenching export-oriented agriculture in targeted countries. If the targeted countries are themselves food-insecure, as is the case for Ethiopia, Kenya, Somalia and South Sudan, just to name a few, food security for the investor countries may trade-off food security of in the targeted countries as a result of the export focus of land investment deals. For the government of the targeted countries, condition (iii) may therefore be at odds with the interests of foreign food security seekers, as may condition (ii) which prescribes the use of labour-intensive technologies, when perhaps, mechanization that leads to labor-saving technologies may be profit-maximizing instead. Both conditions indeed may make it less profitable for foreign companies to pursue land-investment deals in Africa, implying that a win-win situation may not be feasible.

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