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PLOWING AHEAD: THE EFFECTS OF AGRICULTURAL MECHANIZATION ON LAND TENURE IN BURKINA FASO

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Tensions are emerging in Burkina Faso between mechanized agriculture and traditional land tenure policies. Although the influx of tractors came late to the country, their increasing presence has led to agricultural land expansions that encroach on plots granted to small farmers through traditional processes. This paper explores these tensions in four main sections. The first section traces the changing land tenure policies in Burkina that have resulted in a delicate balance between official laws and customary practices. The second considers the rise of agricultural mechanization and the growing significance of tractors. The third examines the various tensions, exacerbated by rising populations, which arise as mechanization encroaches on traditionally held lands. These tensions lead to the exploitation of labor, persistent land grabs, and the forcing of small farmers into a void in which few market alternatives exist. To help mitigate these tensions, the final section recommends the tempering of large tractor expansion and the gradual adjustment of land tenure policies toward increased privatization. By harmonizing land tenure policies and agricultural mechanization, the conditions will exist for more prudent development in Burkina Faso.

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INTRODUCTION

Agriculture is becoming increasingly mechanized throughout the world. As industrialized nations approach complete mechanization, many developing countries are also making significant shifts toward mechanized farming.

In Burkina Faso, farming techniques are changing, but the shift toward mechanization is not without difficulty. In particular, there are growing tensions between farmland expansion due to mechanization on one hand, and traditional land tenure policies on the other. This paper explores these tensions by considering the changing land tenure system in Burkina, the rise of mechanization in the country, and the relationship that develops between these two phenomena.

Setting the Stage

While agricultural mechanization and land tenure policies in Burkina Faso have been evolving autonomously over the last few decades, they are not entirely independent issues. Broadly speaking, tension arises when the spread of mechanized farming begins to encroach on the land rights of small farmers who are not able themselves to mechanize. This paper argues that, though land is still considered an abundant factor of production in Burkina, mechanization will begin to have effects similar to those of a rapidly expanding population, namely that the demand for more area will push people to marginalized lands. At some point, as single-farmer plots, and then village areas, expand within the borders of the country, conflict will arise, and the poor will likely lose out to the rich. This scenario is not imminent in Burkina, but the tensions are no longer insignificant.

From the perspective of neoclassical economics, the tension between land rights and mechanization is a straightforward one to resolve: expanding mechanization will favor the efficient over the inefficient, and as long as land rights are privatized and sellable, inefficient farmers will have profitable reasons to abandon their land and invest their resources in a different sector of the market economy. Thus, everyone will be better off.

The difficulty, though, is that Burkina Faso does not fit neatly into the globally connected, market-driven puzzle. A landlocked country of approximately 11.5 million people, Burkina is considered one of the world's poorest (World Bank 2001, 44), and like many poor countries, it has only "one foot in the market" (Bruce 1993, 36). According to International Monetary Fund (IMF) statistics, 91.8% of the population relies primarily on subsistence farming for its employment (IMF 2002), which complicates market participation. Burkina has a populatin density of 260 people per square kilometer of arable land, and land quality ranges from fertile in the south to arid in the north (World Bank 2001, 44). Furthermore, Burkinabé culture remains tightly wedded to its traditions, which include sacred treatment of the land, unconditional respect for elders and traditional leaders, and clearly defined gender roles. All of these factors complicate the shift to privatized land holdings that the process of mechanization encourages.

Despite these complications in Burkina and elsewhere, contemporary development policy, guided by mainstream economic thought, assumes that growth is a prerequisite for reduced poverty, and that commercial activity is the catalyst for economic growth. Competition and private ownership are considered essential. What is important, then, as we explore the mechanization-land rights tension as it manifests itself in Burkina Faso, is to consider how sound development policy might be applied in socially acceptable ways.

The paper begins by examining agricultural land tenure policies as they exist in law and in practice. The finding is that 1) there is currently enough agricultural land in Burkina, but that this will not always be the case, and 2) whether intentional or not, a delicate balance between official laws and customary practice has been reached that allows for the thriving of harmonious agricultural communities. Next, it considers the rise and status of agricultural mechanization in Burkina Faso. Focusing on the influx of the tractor, this article demonstrates that mechanization is beginning to have significant effects in Burkina, not all of which are positive. The third section of this article addresses the tension that arises between agricultural mechanization and land tenure rights. It explores this tension from political, economic, and social perspectives with the aim of convincing the reader that land in Burkina will not always seem limitless, and that small farmers face a real danger of being left with nowhere to go. The final section develops some recommendations to mitigate the mechanization-land rights tension. The article's ultimate suggestion is that the process toward mechanization must be regulated just enough to ensure that perceptions and laws governing land tenure have time to adjust to a competitive and privatized world.

LAND TENURE

A discussion of land tenure must first consider the common traits of traditional, or customary, land tenure systems. Once this groundwork has been established, traditional land tenure in Burkina may be explored, keeping in mind that traditions may differ not only from country to country, but between regions within a country, or even from ethnicity to ethnicity, of which there are over 70 in Burkina (Jeune Afrique 1998, 39). After establishing the effects of the lineage-based system that exists in traditional Burkina Faso, this article will turn to the

influences that both colonial forces and international organizations have had on land tenure policies in the country. This will set the stage for an examination of the official laws that have evolved to recognize land tenure in Burkina. What becomes apparent is an ongoing faith in the abundance of land, as well as a delicate balance between official laws and customary practices that has thus far served as a practical means of managing land usage.

Traditional Land Tenure

Across Africa, traditional land tenure policies share certain features. One common attribute is a reliance on lineage in determining who has rights to a plot of land. Generally, this system of inheritance results in increasing fragmentation of farm plots, as heads of households are required to leave land to more than just one person (Bruce 1993, 45). A second feature is the presence of a *chef de terre*, or land priest, who is responsible for managing disputes and assigning land that is not currently occupied through lineage. Examples can be found in Ghana (Lòpez 1997, 21) and Côte d'Ivoire (Bassett 1993, 131).

Traditional land tenure systems in Burkina Faso are not unlike those in neighboring countries. Land is distributed based on relationships to the founding lineage, and a chef de terre resolves disputes and allocates unclaimed land. The manner in which this is done differs from region to region. In the eastern Gourmantché region, unclaimed land for farming may be obtained by anyone whose grandfather farmed land around the village.[1] Among the Mossi people of the Central Plateau, long-term allocation rights are set by the village chiefs and distributed to heads of households in the lineage. Those household heads are then responsible for distributing land to extended family members to ensure that food supply needs are met (Sanders et al. 1990, 6). In the southwest Bobo territory, the chef de terre appoints men in the

village chief's patrilineage to a land committee, and it is the role of this group to assign farming rights to members and extended family (Saul 1993, 80).

Certain effects of the lineage-based system are apparent across ethnicities. Foremost, as noted above, is the tendency toward fragmentation, or the increasing subdivision of plots. Though it contributes to inefficient farming, fragmentation is less of a problem the further out one goes from the village, as here farmers are using land that was previously unclaimed. A second effect of the lineage system is the presence of land borrowing (de Zeeuw 1997, 585). Farmers not entitled to lands through lineage would face the prospect of going landless and thus without a sufficient food supply; the solution is to borrow land from a farmer entitled through lineage. This can and occasionally does create ethnic conflicts when members of an outside ethnicity—often the powerful Mossi—borrow land and establish a base for the influx of their own extended families.[2] In general, however, problems are avoided because borrowed lands confer only temporary rights.

Colonizers and International Organizations

Over the last half-century, exogenous forces, first from colonialism, and later through international organizations, have contributed to changes in the understanding of land rights in Burkina. The impact of these forces on traditional practices is worth considering.

Colonizers themselves had changing views about agricultural land tenure in Burkina Faso. In the first half of the twentieth century, French colonial leaders promoted a policy that discouraged ownership of agricultural lands, though this had less to do with their support of traditional systems than with their desire to monopolize land rights themselves (Bassett 1993, 7-8). Later, however, there was a shift in the colonial rhetoric to a policy promoting individual

ownership rights, as the belief emerged that private ownership was the only means of ensuring increased agricultural output. This policy outlasted colonialism and, in the aftermath of independence, Burkinabé leaders arduously supported individual ownership of land, perhaps believing that a policy of this sort gave them greater credence in their quest to be considered a modern state.

The international aid community made similar contributions to the land tenure debate. Having done little with respect to land reform in Africa throughout the 1960s and 1970s, and having witnessed the stagnation of agricultural production during this period, organizations like the World Bank began aggressively promoting the privatization of land ownership in the 1980s. This approach was based on the neoclassical argument that formal tenure leads to greater investment by the owner, and thus results in increased levels of production (Bassett 1993, 14). Yet even as the efforts of the Bank and other organizations continue, enthusiasm in much of Africa has been tempered, especially at local levels. Traditional exchange agreements between lenders and borrowers of land remain more comprehensible to farming communities and weaken the perception of a need for formal tenure.

Burkina's Official Laws

As shown above, the post-independence perspective on land tenure in Burkina has shifted toward private ownership, yet there has been resistance to leaning too far in this direction. The official laws of the country have taken a similar path. The laws that existed from the 1960s into the 1980s closely resembled traditional practice, as land was not owned by individuals but allotted on a usufruct basis. This system was highly respected, likely because it was traditionally comprehensible (Faure 1995, 3). However, sporadic cases of individuals

or villages challenging the spirit of these laws were enough to force a shift away from reliance on tradition. In a case that foreshadowed the debate between land tenure and agricultural mechanization that is at the center of this paper, merchants from the village of Beghedo purchased a tractor and obtained a land allocation from the chef de terre of the neighboring village of Niaogho in 1983 (Faure 1995, 4). They proceeded to make use of hundreds of hectares of unclaimed land around Niaogho, causing anger amongst the villagers and a confrontation between the two villages. This dispute made evident the fact that traditional distinctions between ownership, management, and usage would not remain tenable.

In 1984, under the guidance of the revolutionary President Thomas Sankara, Burkina instituted the Agrarian and Land Reorganization (RAF),[3] whose principle effect was to declare that all land belonged to the state (Faure 1995, 5-6). The idea was to purge traditional land rights from the official law, which it indeed did, but an unintended negative effect also arose: because land could be claimed (though not owned) by "those who could work it," the law encouraged farmers to expand their holdings. By demonstrating minimal usage, farmers were able to control reserve stocks of land, to be saved or bartered surreptitiously. In this sense, little progress was made from the 1983 conflict in Niaogho.

In 1991 a new RAF text was introduced in Burkina to remedy the consequences of the 1984 law and, at the same time, to introduce officially the notion of private ownership. The first major change was outlined in Title II of Law No. 014/96/ADP (Government of Burkina Faso 1991), which created the National Land Domain (DFN),[4] comprised of all lands within the limits of the state. Article 5 of the same law goes on to introduce the second important change: that certain lands of the DFN can be "ceded as private property" to citizens of the state. Because the management of private property would take place at the village (traditional)

level, this law attempted to address the competing demands of public and private ownership, while acknowledging the importance of customary practice (Faure 1995, 7).

The Delicate Balance

What are the results of these seemingly ambiguous and very delicate laws? Traditional leaders are cautiously supportive owing to the attention paid, however vague, to the socio-political and religious views of the local farmers (Tersiguel 1995, 39). Applied loosely, the law still allows the lineage system to carry weight through its application at the village level, which reduces the potential for conflict among villagers while introducing privatized land. When asked his opinion of the effectiveness of the land tenure policy in Burkina, Mr. Kalindari Tankoano, an educated civil-servant and mid-scale farmer, offered the following analysis:

> I think people consider the law to be very fair. We rarely see problems involving conflicts between two parties, and everyone is able to get enough land to farm. When someone wants to farm larger areas of land, all he has to do is go further out from the village. He'll find plenty of land there.[5]

These comments reveal another key in the success of the laws, something to which this paper has already referred: the assumption that land is limitless. As long as arable land is left uncultivated, and anyone seeking a plot can obtain it one way or another, then the perception of land abundance will remain, and land tenure policies will be considered sustainable and relatively fair.

Another result of the policies in Burkina is a pronounced flexibility in the allotment of farming plots. While this has significant positive effects that allow farmers to use the best lands available and to live outside of their family village, there are two possible negative effects that confront the assumption of limitless land: 1) more people having access to land in

a given area, and 2) greater shares of land made available to big farmers (Saul 1993, 81). As we begin to explore the role of agricultural mechanization in Burkina, it will be useful to keep these points in mind.

AGRICULTURAL MECHANIZATION

We now turn to the second critical issue in this argument: the mechanization of agriculture. Just as conceptions about land tenure were evolving in Burkina Faso, agricultural mechanization was undergoing a change of its own. Burkina presents an interesting case in this regard, because, unlike other African countries, the introduction of mechanized agriculture came quite late and through very informal processes. Thus, we are able to conduct a pertinent and timely examination of the process in Burkina, currently in the critical stage after introduction but prior to, and without assuming, widespread use and unanimous acceptance. To clarify, although mechanization generally refers to the introduction of any type of machinery into the agricultural setting, most pertinent to Burkina Faso is the influx of tractors. Thus, when we speak of agricultural mechanization, it is primarily the process of *tractorization* that is taking place. These tractors are typically of European origin, of medium output (between 45 and 65 horsepower), and serve as the only form of tillage in a mechanized field, since fields in Burkina generally do not receive secondary tillings (FAO 1998).

Here, I consider conventional agricultural practices in Burkina before tracing the rise of tractors in the field. Once the current status of agricultural mechanization in Burkina Faso is explained, the issues of mechanization and land tenure may be brought together. At this point, we begin to see that the very flexibility that allows the system of land tenure to thrive also

opens the door for an expansion of mechanization, which in turn may lead to contentious effects on the land tenure system.

Agriculture in Burkina

Agriculture has been called "an argument with nature" (Batie 2001, 261) for its promotion of a limited number of plant species in contrast to nature's tendency toward diversity. In Burkina Faso, this argument is a difficult one, given the harsh realities of generally weak and infertile soil, intense heat that can burn crops without adequate water, and unpredictable rains. In general, farmers subsist by cultivating enough land to feed their families and by selling any leftover portion, ideally 10 to 20 percent of the crop, to obtain other necessities (Sanders 1990, 11).

The crops that are harvested in Burkina Faso are relatively few. Millet and sorghum are the staples, used to feed most families and to make traditional beer. Approximately 80 percent of cultivated land is dedicated to these two crops (Sanders 1990, 5). Maize is often cultivated around village compounds,[6] and some crops—primarily peanuts and green beans—are planted in relatively small quantities as cash crops. One other crop, cotton, is vital to Burkinabé agriculture. As the country's principle cash crop and primary export (Jeune Afrique 1998, 46), cotton impacts commercial growth in ways that other crops do not. Economic benefits accrue to those who harvest the crop, leading to even greater commercial opportunities (Saul 1993, 81). Thus, income divides develop between those who can harvest cotton and those trapped in a cycle of subsistence.

The Rise of Mechanization

Having noted the standard agricultural practices in Burkina, we may now consider the rise of agricultural mechanization. Across Africa, just as there was a post-independence push toward increased privatization of land rights, so too was there an urge for more tractors in the agricultural setting, an urge perhaps welcomed by African states seeking to put on a modern face. The rise of tractors has also been attributed to the promotional efforts of the former colonial powers (Sanders 1990, 2). Those colonial efforts have led, and continue to lead, to the importation of machinery whose appropriateness to the African landscape has never been wholly considered (Ahmed 1984, 4).

While tractors bring certain advantages, such as increased labor productivity, contract work and rental opportunities for owners, and reduced drudgery (FAO, 1998), there are also significant drawbacks to tractor use in Africa. The cost of a tractor is typically several times an average farmer's annual income, and this discriminatory factor is compounded by fuel and maintenance costs and a short, unpredictable season.[7] Furthermore, tractors may lead to the exploitation of women, since it is the role of women to weed and harvest the fields at the end stage of cultivation (Tersiguel 1995, 264); I will return to this point shortly. Tractors also require increased training, cause greater soil erosion, and demand large areas of land to ensure that ownership will be cost-effective (FAO 1998). Thus, it is not evident that the tractor is the most appropriate tool for African farmers.

Mechanization Particular to Burkina

Within Burkina Faso, the rise of mechanization has been very slow relative to the process in other African countries, as Burkina has been the target of fewer development projects. While

other African countries were experimenting with tractors just after World War II, Burkina at that time was only beginning to explore animal traction, an effort that never flourished due to pastoralist and agriculturalist conflicts.[8] The tractor itself was not introduced in Burkina Faso until the 1970s (Tersiguel 1995, 76), and then only on a very small and informal scale. Therefore, Burkinabé farmers have continued to farm as they have for generations, on the strength of the *daaba*.

The daaba is a wooden-handled hoe with an iron head, which the farmer uses by stooping over and pulling the earth. The handle is generally quite short, though it may be longer in areas where the soil is sandier. The instrument is considered to be both reliable and flexible, allowing farmers to till almost any terrain (Guillaud 2000, 97). Just as importantly, the daaba has an element of traditional prestige, since every farmer's ancestors tilled in the same fashion—daaba farmers thus believe that they are practicing *true* farming (Marzouk 2000, 21). Nevertheless, tilling large expanses of field remains extremely difficult for the daaba farmer.

Although the daaba remains heavily relied upon, and the presence of tractors remains sparse, tractor numbers are growing. According to the Food and Agricultural Organization (FAO), there were 1,933 tractors in Burkina Faso in the year 2000, which, as a number of tractors per 1,000 agricultural workers, was essentially insignificant (FAO 2000). However, the number of tractors per 100 hectares of arable land has grown from zero in 1980 to six in the year 2000 (World Bank 2001, 130). This indicates that, though the percentage of farmers who use tractors is still very small, the impact that these farmers have on cultivation areas is undoubtedly expanding.

The small but increasing presence of tractors in Burkina has evolved as the conditions for mechanization have improved in the country. To support a farming culture based around

mechanization, three conditions must be present: 1) sufficient levels of income, 2) market opportunities, and 3) a sound cash crop. The income levels in Burkina have been improving steadily, not only in the farming sector, but also among the civil service. This allows greater numbers to set aside income for new purposes. Market opportunities have improved as banks and credit institutions have begun to make credit available to Burkinabé, though still on a minor scale. Finally, with the help of the government, cotton has become a well-established cash crop in Burkina, thus providing farmers with the incentive to mechanize.[9]

Interestingly, agricultural mechanization in Burkina has also been accompanied by a shift in the identity of the farmer. Paradoxically, the *true* farmers want to leave farming, while non-farmers are entering the field. Young farmers, seeing the discrepancy between their own traditional efforts and the ease with which big, mechanized farmers are able to till land, increasingly resent the drudgery and seek to escape farming. Conversely, rising incomes among the educated class lead to the possibility of farming as an investment (Gyarteng 1976, 80). This sparks a greater demand for tractors and village land by the city-dwelling elites, leading to an influx of "gentlemen" farmers (Solbrig 2001, 18). Thus, although the introduction of tractors in Burkina has come slowly, the effects of increased agricultural mechanization are no longer insignificant.

TENSIONS BETWEEN LAND TENURE AND AGRICULTURAL MECHANIZATION

We may now begin to think more thoroughly about how agrarian land tenure and agricultural mechanization might operate in tandem. Tensions arise on several fronts. First, the increasing presence of tractors affects labor and production in Burkina, since new farming techniques can dictate changing land needs. Second, tractors create pressure for land acquisition, which raises

direct conflicts with policies of land ownership rights. Third, market tensions arise between the need for competition and the need for alternative activities in the economy. Finally, political pressures exist that may make the combination of tractorization and current land tenure policies untenable for the future.

Tractor Effects on Labor and Production

Land needs change with mechanization; tractor farmers can and must till larger areas to ensure sufficient incentive for their investment in mechanization. The tensions that this expansion creates may be mitigated, of course, if the change leads to less labor exploitation and improved food production. Unfortunately, this has not been the case.

Clearly defined social roles in Burkina dictate that men till the fields and women do the weeding and harvesting. As tractors till greater expanses of land with less labor, male laborers are displaced and their short-term tilling employment is eliminated. Perhaps more significant, however, is the exploitation of women that tractors provoke (Tersiguel 1995, 264). Because harvesting equipment has not been introduced in Burkina,[10] women are forced to keep up with the tractors by hand. Thus, just as work is taken away from men, more is demanded of women. They are typically not paid for their work in the fields, as men may be during the intense tilling period. Rather, women in the extended family of a tractor farmer are pressured to "do their part" when harvesting time arrives. The strict separation of tasks between men and women precludes the possibility of reallocating to men the extra harvesting labor that tractor-tilled fields create, so that tractors actually have a harmful, exploitative effect on female laborers.

As for production, though tractors allow for increased *output*, there is no evidence that tractor farming has a positive effect on agricultural *yields* (Pingali et al. 1987, 102). Improved production per unit of land is a function of better quality tillage, and tractors provide no advantage here vis-à-vis daaba farming. Furthermore, in order to assure returns on their investments, mechanized farmers concentrate greater proportions of their land on the production of cotton (Tersiguel 1995, 259). Thus, while agricultural output increases, food crops in fact decrease as a percentage of cultivated land. Total food production may or may not increase in absolute terms, but the disproportionate shift toward cotton, whose economic benefits revert solely to the cotton farmer, represents a relative loss to a society still struggling to overcome severe malnutrition (Tersiguel 1995, 264).

Pressures on Land Acquisition

It remains the case that "substantial access to land" (Sanders 1990, 6) persists in Burkina Faso and in almost all of Africa. However, clear incentives exist for tractor owners to expand their holdings exponentially, and, under essentially open access conditions, they have little reason to consider the declining returns to their tillage. Here it becomes critical that agricultural land in Burkina is considered the property of the state, as part of the National Land Domain, which is allotted by village leaders on a usufruct basis[11] and which can be ceded for individual ownership. Big farmers with tractors are able to clear and use relatively vast areas, and these same farmers tend to have the greatest opportunities to turn their holdings into private property.

Furthermore, land acquisition can be a real problem between adjacent villages, as the 1983 Niaogho case illustrated. After all, even though arable land may be plentiful in Burkina, the

land that farmers value most is the land extending outward from their own village. Thus, depending on the proximity of adjacent villages, land may seem to "run out" much sooner than it actually does. A second case where conflict is beginning to arise is in the southeast province of Kompienga (UNU 2002). Farmers from Pama, the provincial seat of the province, have customarily extended their operations toward the small village of Kompienga. However, since a hydroelectric dam was built in Kompienga village in 1982, its population has risen and now surpasses that of Pama. The newcomers in Kompienga are seeking land to farm, and what was once considered open expanse by the village of Pama is now within the administrative bounds of Kompienga.

Market Tensions

The tensions created by market forces are also significant, particularly because agricultural mechanization can contribute positively to economic growth and development in a country like Burkina Faso. As mentioned earlier in this paper, economic growth for Burkina Faso requires commercial growth in the agricultural sector, as this process will spur increased investment. Furthermore, as part of its structural adjustment program with the IMF, Burkina has been encouraged to strengthen its capacity for privatization and formal tenure across all sectors (IMF 2002). The result is an increasing dedication to conditions of market-based competition. In this sense, efficient farmers are forcing out less efficient ones, which leads to fewer but larger farms (Paarlberg 2001, iv).

Tension arises here on two levels. First, the pressures of competition are in conflict with the fragmentary nature of traditional land tenure. The lineage-based model for land distribution is not economically efficient, but it remains a socially harmonious practice.

Second, and critical to the perspective offered in this paper, is the tension that arises for farmers who are "freed" to pursue other activities, but who have no realistic alternative for making a living. Competitive market forces are arguably part of a shrewd process that ultimately results in higher per capita incomes and improved standards of living. At the same time, however, successful competition is predicated on the existence of alternative market activities (Paarlberg 2001, iv). If the alternatives exist, then competitive forces would be of great value to Burkina Faso; if they do not, then the security of a large portion of the population is critically threatened.

Socio-Political Tensions

A final set of tensions worth exploring arises through the socio-political climate in Burkina. Fortunately, the country has enjoyed several years of relative calm and has received tacit international support for its policies. However, a subtle class struggle has developed as villagers understand the advantages that elites enjoy from their political influence. With respect to the land tenure debate, villagers are becoming increasingly resigned to the fact that those who obtain land from the government are those who have the ear of political decision-makers, thus assuring them the land they want in the quantities they want. Not coincidentally, these same elites are the big "gentlemen" farmers who own the tractors, which further sparks their desire for land.

Population growth is another phenomenon that contributes to the tension between agricultural mechanization and land tenure rights in Burkina Faso. Burkina's population has been growing at 2.1 percent annually (World Bank 2001, 44), and an increasing population will naturally have greater demands for land. So the question becomes: who is pushed further

away from the village, the tractor farmer or the traditional farmer in the village lineage? This tension will not become easier to resolve, as the population and the presence of tractors are growing in tandem.

The massive influx of Burkinabé returning from Côte d'Ivoire in light of recent political, religious, and ethnic strife there has exacerbated the tension caused by a naturally rising population. Between three and four million Burkinabé have called Côte d'Ivoire home (Jeune Afrique 1998, 30), seeking an opportunity to work on plantations and earn higher incomes than farming in Burkina can provide. However, as the conflict in Côte d'Ivoire has escalated, increasing animosity has been leveled at the Burkinabé in the country, forcing many of them to return to their country of origin. Seeking land of their own, they have been pushed into a situation of already rising tensions.

What Do These Tensions Imply?

Despite growing land use pressures, arable land is still plentiful in Burkina Faso. Additionally, privatization and market competition do contribute to economic growth and improved standards of living (World Bank 2002, 273). Furthermore, open conflict resulting from the effect of tractors on land holdings is in no way imminent. This paper does not contest these claims, but rather seeks to reveal that the *conditions* for conflict exist, and that tensions are likely to rise along with population growth as more tractors are introduced in the agricultural sector.

Tractors, while increasing output through larger cultivated areas, have exploitative effects on labor and push cultivation away from food production, thus reducing the relative social value of the expanded areas they require. Tractors also create tensions concerning land

acquisition, since they promote land grabs. This tension is especially strong between adjacent villages. Tractors may soon have the effect of pushing small farmers out of subsistence farming and into a void where very few market alternatives exist. Finally, tractors may contribute negatively to class struggles at a time when Burkina's rising population is making land harder to attain.

This is not to say that there is no place for tractors in Burkina Faso, only that a potential for future conflict exists at the crossroads of agricultural mechanization and land tenure policies at the village level. The following recommendations seek to enable mechanization and land tenure policies to develop harmoniously, as part of a prudent development scheme.

RECOMMENDATIONS

On the side of agricultural mechanization, there has generally been little national or institutional guidance from the government in Burkina Faso (FAO 1998). Similarly, the government has adopted a hands-off approach to the enforcement of the land tenure policy, setting official guidelines but allowing traditional village leaders to apply the rules in ways that differ little from customary systems of lineage-based rights. The recommendations below, meant to ease the tension between mechanization and land tenure before conflict develops, suggest a more active role for the government.

Recommendations for the Management of Agricultural Mechanization:

1. Promote smaller, more efficient machinery in the agricultural sector. Small-size tractors, as well as motorized tillers,[12] would be affordable to small farmers and would also place technological limits on the expanding area that mechanized farmers are able

to cultivate. This constraint would slow the shift to massive tractor farms, ensuring a more gradual change in farming and allowing land tenure policies, as well as social perceptions of land rights, to adapt appropriately.[13]

2. Introduce harvesting equipment that could contribute to the end stages of cultivation and thus liberate exploited labor. Machinery that facilitates harvesting would correct the labor imbalance that incomplete mechanization creates when it reduces labor requirements in the tilling stages and demands extra work from women in the later stages.

Recommendations for Land Tenure Reform:

Thomas Bassett notes that any reform of an African tenure system should be built on the strengths of the indigenous system, because a blind move toward privatization will not ensure increased production and may lead to widespread social disapproval (Bassett 1993, 25). With this in mind, I offer two recommendations that could establish the conditions for increasing incomes in a socially acceptable manner:

1. Begin formalizing private holdings, but in a manner respectful of traditional systems. The policy of ceding national lands for private ownership could be accelerated, not for influential elites, but for families having longstanding claims in a village. Unclaimed land further away from the village could be sold in plots by the government. Newcomers would thus have the opportunity to establish themselves as farmers where availability permits.
2. Tie the sale of larger land areas to food production requirements. Rather than allowing wealthy farmers to occupy growing swaths of land solely for the production

of cotton, policies could require that a portion of the land be devoted to cereals like millet and sorghum. Returns to the farmer would be lower (a constraint on unfettered capitalization of land), but food security problems would be less severe as a result.

The suggested policy reforms should serve to mitigate the tension between land tenure and agricultural mechanization, thus softening the social upheaval that could result from either clashing systems or drastic policy shifts. Of course, with the introduction of any mechanization, some farms will increase in size, and some traditional farmers may be pushed off of their land. Therefore, these recommendations would be most successful combined with broad government efforts to develop market-based alternatives to subsistence farming. That discussion, however, is beyond the scope of this paper.

CONCLUSION

The rise of agricultural mechanization in Burkina Faso will occur, with or without policies to guide it (FAO 1998). For this reason, it is imperative that the issue be addressed before serious conflicts arise between mechanized farmers and traditional landholders. Threats to land abundance are not urgent now, but this will not remain the case forever. It is wise, then, to confront the mechanization-land tenure tensions in their incipient stages.

To summarize, we first explored the land tenure policies in Burkina Faso and saw that the traditional land tenure system based on village lineage continues to thrive. Indigenous policies have been incorporated into official laws, and a delicate balance has emerged between the public, the private, and the customary in Burkina.

We then considered the rise of agricultural mechanization in Burkina Faso. Today, there are still very few tractors in the country, and most farmers continue to till their fields manually. However, tractor use is growing quickly, and the effects that tractors have on agricultural land expansion have given rise to tensions between mechanization and land tenure.

Looking more closely at these tensions, we found that a gradual adjustment of land tenure policies toward increased privatization, coupled with government efforts to moderate slightly the expansion of larger tractors, could benefit Burkina Faso. By promoting market participation in a socially acceptable manner, the conditions should exist for a prudent and sustainable development scheme.

The question may now be asked: what does this story reveal for other countries facing similar tensions? Across Africa, problems such as elite land grabs, commercialization of traditionally held land, and exploited labor persist; examples can be found in Botswana (Werbner 1993, 101), Côte d'Ivoire (Bassett 1993, 143), and Kenya (Mackenzie 1993, 196). The lessons are most applicable to Burkina's West African neighbors, where both levels of mechanization and traditional land tenure systems closely resemble the situation in Burkina Faso.

Even within the region, tensions may vary depending on the relative stage of mechanization. For example, the strong commercial agricultural industries in Ghana and Côte d'Ivoire during the 1970s made those countries attractive to aid organizations, which in turn led to a large increase in the number of tractors. Ironically, those countries now have *fewer* tractors per 100 hectares than they did in 1980 (World Bank 2001, 130), evidence that the rapid influx of tractors was not sustainable or socially acceptable. For most countries in the

region, however, tractor numbers resemble those in Burkina Faso, making the present an ideal time to consider the rising tension between traditional land tenure and agricultural mechanization.

What is certain is that where subsistence farming remains the predominant source of employment, and where traditional land tenure is defined by flexible, lineage-based norms, a significant influx of tractors will conflict with the land tenure system. This paper has demonstrated the need to balance market-driven policies with arrangements that respect and suit the unique social structures existing at the village level in African countries.

NOTES

[1] Kalindari Tankoano, telephone interview by author. Pama, Burkina Faso, 20 November 2002.
[2] The Mossi are often considered a "colonizing" ethnicity. See Saul, p. 87.
[3] Réorganisation Agraire et Foncière
[4] Domaine Foncièr National.
[5] Tankoano, interview.
[6] Tersiguel has written of an "intensification gradient" in village farming. Maize, which can be harvested early and quickly to address cereal shortages, is generally planted close to the homes, while large quantities of easy-to-grow crops, such as millet, are planted further out, in the bush fields; p. 56.
[7] Since rains are often unpredictable, the farmer's prospect of capturing adequate returns on the purchase of the tractor are uncertain at best.
[8] The pastoral Fulfuldé ethnicity, responsible for the cattle and oxen, are often in conflict with other farming ethnicities. Often, destumping costs make jumping from manual tilling to tractor use inefficient, but the practice is possible in Burkina due to the prevalence of grassy savannah.
[9] The government of Burkina has managed the sector with a cotton-buying monopsony, SOFITEX, ensuring protection for farmers against falling prices. This has led to the planting of more acreage, and as a result, farm incomes actually rose by as much as 70 percent in 2001. See FAO 1998 and IMF 2002.
[10] This is so because harvesting labor remains cheap (as women are exploited), and abundant (as there are less time pressures during this period than during the planting period).
[11] Usufruct rights confer the privilege to use (though not own) land so long as the use is productive and does not lay waste to the land.
[12] Some motorized tiller programs have been attempted elsewhere in Africa without resounding success, but the benefits of small machinery seem too valuable not to explore.
[13] I have resisted the temptation to suggest a restriction on large-size tractors, because, as the current supply is not overwhelming, a better approach is to promote an alternative to these tractors. Ideally, industries in Burkina would eventually have a hand in the production of the small machinery that is recommended, but that consideration is too large to address in this paper.

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