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Agriculture in sub-Saharan Africa

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I – INTRODUCTION

According to the World Food Programme, with the exception of Haiti, all of the world's countries that experienced a malnourishment rate of 35% of the population or higher last year are located in sub-Saharan Africa. Of the nearly one billion hungry people in the world, one quarter of them are Africans. Why is it that they are not better-able to feed themselves (or others, for that matter) with their vast amounts of undeveloped land? The goal of this paper is to demonstrate the historical and developing influences of globalization and gender on agriculture in sub-Saharan Africa, and what is being done to help natives obtain and sustain self-sufficiency.

To do so, this paper will examine many of the cultural, governmental, and environmental obstacles to improving African agriculture. It will start with brief background information covering what traditional agriculture was like in sub-Saharan Africa before, during, and after the dominant influence of colonialism. The next section will delve into the side effects of globalization on the region, piecing together both intended and unintended consequences. The issue of gender will be analyzed, particularly the traditional and modern roles that women play, in order to better understand how culture has impacted agricultural development. Finally, the roles that finance, insurance, research, and climate play will all be considered in respect to their effects on the future agricultural prospects of African farmers.

II – BACKGROUND

Just prior to the arrival of Europeans, African society could best be described as having been in a transitional stage. The traditional system of hierarchy was based on the age of its members, with the eldest being the most respected and revered among citizens for their wisdom. It was fading, however, as access to iron tools replaced inferior ones made of stone, permanently changing the way occupations were carried out; castes were emerging among societies, with particular and useful skill sets that were passed down within family units from one generation to the next. Those families who had the most useful skills began to garner the most respect. Among such occupations, subsistence agriculture was an important one, as those who practiced it in Africa adapted to their demanding environments in innovative ways: “advanced methods were used in some areas, such as terracing, crop rotation, green manuring, mixed farming, and regulated swamp farming”

(Rodney, 1974, p. 40). Many of these farmers formed partnerships with nomadic pastoralists to supplement their nutritional and trade needs.

More recent research suggests that nomadic pastoralism was the dominant infrastructure of sub-Saharan Africa before the arrival of Europeans. Nomadic pastoralism is defined as “the adaptive strategy of moving the herds that are one’s livelihood from pasture to pasture as the seasons and circumstances require” (Bates, 2005, p. 118). The fragile and thin topsoil of the region is only capable of supporting grazing for a short period of time, so herds must constantly be on the move to prevent them from eating roots and destroying the ecosystem. The ancestors of those who still practice this method today were the primary means through which information and trade goods travelled across the continent.

Beginning in the fifteenth century, European interest in Africa was solely for the procurement of slaves to work in plantations in the New World. Africans were more resistant to European diseases because of their proximity and historical exposure, and many of them were already accustomed to intense agricultural work, much unlike the indigenous people of the Americas (Walter, 1974). Colonial governance, particularly in the French West Africa region, gradually saw the decline of slavery through to the twentieth century as cash crop exportation took its place. These crops, including groundnuts, palm products, cocoa, and cotton were produced solely for profit from trade, while the traditional roots and tubers that constituted a large, traditional staple of calorie consumption were neglected. During this period of colonial rule, local knowledge of the balance between agriculture and pastoralism was largely lost as borders were drawn and able-bodied men and women were captured and sold abroad (Austin, 2009). One unfortunate side-effect of this restructuring was that until very recently, it was the nomads who were blamed for the plight of agriculture.

III – THE CONFLICTING INTERESTS IN AGRICULTURE OF MODERN GLOBALIZATION

Globalization is defined as the increasing integration of global economies enabled by free trade, free flows of capital, and the utilization of inexpensive labor markets (Globalization, 2011), and as such is seen as a complex and controversial agenda to attract investments and compete with sales among countries and multinational entities. The consequences of squandered opportunities and resources by former colonies have been that in addition to widespread famine, many regions of sub-Saharan Africa were unprepared to deal with the coming wave of modern globalization. Eighty percent of the population relies on locally-grown food, but nearly half of what is grown gets lost because of “poor harvest-handling, including storage, transport, processing, and marketing” (Ochieng, 2007, p. 144). Additionally, agricultural exports by developed countries are

inexpensive, high-tech, and mass-produced, leaving little incentive and huge barriers for the least-developed countries (LDCs) to try and compete against. As such, “the participation of the LDCs in international agricultural trade is insignificant and has been declining. Their share in world agricultural exports has dropped steadily, from 3.2 percent in 1970-79 to 1.9 percent in 1980-89 and a mere 0.9 percent in 2000-04” (Koroma, 2007, p. 5). Such a decline is a heavy contrast to the global annual increase of agricultural exports of over ten percent per year during the same time periods.

Combined with the detrimental effects of conflicts and natural disasters such as droughts, many of the least-developed countries (LDCs) have had trouble producing enough to feed themselves, let alone export food. The Global Hunger Index (GHI) is a measurement based on malnourishment and child mortality rates, and in 2010 revealed “that 29 countries in the world have hunger levels that are considered alarming or worse. Twenty-two of these – more than two thirds – are located in sub-Saharan Africa” (Stein, 2010). Further complicating this issue of hunger is the fact that many of these countries’ governments are actually working against their people, selling or leasing their most fertile land to foreign interests for quick cash. While such areas may be used to employ local women as harvesters, the high-quality food that they grow is exclusively exported for profit. For example, on one such state-of-the-art, fifty-acre facility in Ethiopia,

millions of tomatoes, peppers and other vegetables [are] being grown in 1,500 foot rows in computer controlled conditions...and 1,000 women pick and pack 50 tons of food a day. Within 24 hours, it has been driven 200 miles to Addis Ababa and flown 1,000 miles to the shops and restaurants of Dubai, Jeddah and elsewhere in the Middle East (Vidal, 2010, p. 1).

Similar projects are occurring on a massive scale in sub-Saharan Africa and are exploiting more than just hungry locals and cash-strapped governments; they may in fact be exploiting international laws designed to help those countries. The United States’ *African Growth and Opportunity Act* of 2000 and the European Union’s *Everything But Arms* proposal of 2001 both targeted sub-Saharan African countries as the beneficiaries of tariff-free importing to their respective areas for agricultural goods (Koroma, 2007). These laws were designed to stimulate investment in the area’s infrastructure, but poor bargaining by the local governments has given nearly all of the advantage to the foreign companies. Some of them are not even charged for water usage, including the facility from the previous example, which “uses as much water a year as 100,000 Ethiopians” (Vidal, 2010, p. 4). This is more than just an issue of leasing the area for use of its land, labor, and/or climate; it is essentially exporting a critical natural resource.

For the indigenous farmers in sub-Saharan Africa, yields such as those from modern facilities are typically well beyond their reach, as they lack access to the technological breakthroughs that have recently occurred in the agriculture of the developed world:

Two thirds of smallholder farmers in Africa do not use scientifically improved seeds, most have no access to veterinary medicine for their animals, only 4% have irrigation, and the vast majority use no chemical fertilizers or pesticides (fertilizer use in Africa, at only 9 kg. per hectare, is less than 1/10 as high as the average in Europe or North America), and mechanization is nearly nonexistent (Paarlberg, 2009, p. 5).

Disturbingly, organizations such as Greenpeace and the International Federation of Organic Agricultural Movements insist that these conditions are great for African farmers (excepting the lack of water and mechanization), because it enables them to produce organic foods. The problem with organic food is that it is harder to grow, has lower yields, is more expensive, and has no measured nutritional benefit over foods that are grown using engineered seeds and chemical medicine/fertilizer (Paarlberg, 2009, p. 8). While it may be a profitable niche market, if organic farming were to be enforced worldwide, the drastic food shortage that would follow could starve millions of people.

Farming and husbandry are not the only occupations in trouble for the region; although fishing only fits a loose definition of agriculture, recent developments are nonetheless increasing hunger rates in coastal regions of sub-Saharan Africa. While the waterways are considered a common property resource for the indigenous fishermen, local governments have been selling the rights to fish them to foreigners for some quick cash, and in the case of Somalia, no government is in place to regulate the waters at all. These outside companies bring with them large, state-of-the-art fishing ships that troll the sea bed, often destroying the coral reefs for a quick gain at the cost of destroying the habitats and breeding grounds of marine life. Such practices are already considered illegal and are condemned by the international community, but little is being done by those who are able to curb it. Even the somewhat less-harmful practice of using huge fishing nets is both incredibly wasteful, as unwanted catches are still killed, and incredibly unfair to the locals who lack the technology to compete (The End of the Line, 2009). The result is a devastating cost to a population that relies heavily on fish for their protein consumption, but highly profitable to companies that can sell their catch globally.

A different agricultural agenda for sub-Saharan Africa appeals for increased productivity without having to increase technology: conservation agriculture. Recent experiments in nearby South Africa have had promising results; by encouraging smallholder farmers to switch from growing strictly maize to rotating in legumes, scientists were able to find measurable increases in

desirable chemical components of the soil, most notably nitrogen. Crop diversification helped to put nutrients back into the ground and increase the morale of the farmers working the land through food security (Bloem, Trytsman, & Smith, 2009). However, just because conservation agriculture appears to be working in South Africa does not necessarily mean that it is suited for the more arid sub-Saharan regions. Other researchers have found that the conditions which make crop rotation successful elsewhere are not necessarily present, and that it might in fact decrease yields because of farmers' limited "access to inputs, equipment, knowledge, immediate returns, constraints of labor, [and] constraints of cash" (Giller, Witter, Corbeels, & Tittonell, 2009, p. 31).

In consideration of conservation agriculture's shortcomings, then, a concept of a more permanent change of crop selection still holds weight: switching to growing more roots and tubers, such as potatoes and yams, which are far more valuable than cereals in terms of food security, could have a dramatic effect on African hunger and overall production output. It has been argued that the push from traditional to cereal and cash crops actually changed the preferences and tastes of the indigenous people (Ochieng, 2007, p. 147); the colonial bias against roots and tubers is still observable in many of the crops that are attempted to be grown in regions where they are not necessarily well-suited. The desire of farmers to have a more profitable or better-tasting yield appears to have contributed to the starvation of their fellow Africans.

IV – THE GENDER EQUATION

In order to understand how to better address the problems facing agriculture in sub-Saharan agriculture, care must be taken to incorporate the entire cultural picture into further research. As Ritu Verma puts it in *Gender, Land, and Livelihoods in East Africa: Through Farmers' Eyes*:

In seeking technical standardized solutions to the 'technical problem' of soil degradation, conventional soil management and agricultural approaches sometimes ignore the social aspects of the problem, which seem superfluous and unmanageable. In doing so, they miss the complexities and the deeper sociological, political, and gendered realities of local people and spaces (Verma, 2001, p. 32).

Traditional gender roles of agriculture in sub-Saharan Africa tended to be equally-laborious yet separate. While farming included the contributions of both sexes, tasks were divided into what was considered appropriate for each gender to do; men would prepare land to be farmed, yet leave tending the crops to women. "There does not seem to be much of a basis for holding that women's occupations

were considered to be *inferior* to those of men” (Sudarkasa, 1982, p. 280), just that their culture had clearly defined roles which were considered taboo to cross. Colonialism, slavery, and globalization have all taken part in disrupting this balance. Under colonial rule, the mechanics of agriculture were dictated by foreign cultural values, while the exportation of slaves at two able-bodied men to each woman necessitated that women take on more work as there were more of them left to work the fields.

Today, agriculture accounts for 57% of all employment in Africa (Ochieng, 2007, p. 144), a figure which does not include those who farm only to feed themselves, while women comprise of 80% of the entire agricultural labor force (Paarlberg, 2009, p. 5). However, as globalization spread, initial efforts to improve agriculture in sub-Saharan Africa by foreign interests were directed exclusively at men. Opportunities, resources, and education in particular were given to males in a culture that were, as a whole, no longer very responsible for the success of farming (Sudarkasa, 1982, p. 279). To make matters worse for the areas which still see the traditional segregation of gender roles, the practice of conservation agriculture takes labor responsibility away from men and gives more to women. For example, “hand tillage or ox-drawn ploughing [gives way] to hand weeding that is performed mainly by women” (Giller, et al., 2009, p. 27). This means that even as the main producers of food were being ignored, the workload of their counterparts was being decreased.

Despite the fact that women now do the majority of agricultural labor, very few of them actually own the land that they work on. Prior to colonialism, most land was considered a communal resource, and much more of it was allowed to fallow (a period of time where farmed land is allowed to “rest” long enough for nutrients to naturally return to the soil). Colonial rule failed to recognize the traditional gender roles of agriculture in the region and imposed the Western value of sole ownership and profitability to the men of the household. “Women’s rights to land became invisible within this...legal order” (Verma, 2001, p. 83), transferring power to men. Some laws changed during the 1970’s, such as Kenya’s *Registered Land Act* and *Law of Succession Act*, by no longer explicitly excluding women from being able to inherit land, but the line was already in place and such laws did little to actually alter inheritance; by 1996, only five percent of landowners in Kenya were women (Verma, 2001, p. 83). Lower-class women, then, have little hopes of success outside of marrying into a family that already has land, but even then may not be able to control their assets or enjoy the fruits of their labor.

The importance of African women’s agricultural success is not just limited to rural areas. Among urban populations of southern Africa, researchers have found that the seemingly simple act of gardening has had a dramatic effect on empowering lower-class women. Gardens provide them with a place to escape

their demanding and sometimes traumatic lives, as they are often expected to both raise and provide for their families. If their gardens are productive, women gain the respect of their community, and if the gardens themselves are developed communally, they help to forge a strong identity among participants: “the pride and sense of self-worth that women gain from their capacity to produce fresh vegetables are heightened further when their produce is consumed directly by the family” (Slater, 2001, p. 648). Women, then, should be recognized and empowered as the linchpins of sub-Saharan African agriculture that they are if it is hoped to be improved upon.

V – MICROINSURANCE

For those who own land but are still too poor to develop it for agriculture, or for those who are responsible to do so but cannot afford to (such as women), microfinance is being heralded as a new way to lift individuals out of poverty. Microfinance differs from traditional forms of loans in that it does not require collateral, which banks usually need to alleviate risk, and it does not implement oppressive interest, as loan sharks are often prone to do. Microfinance’s success can be attributed to its most popular structure: weekly repayments, which are augmented by communal accountability. If one person cannot make their payment in a given week, others are responsible for picking up their slack (Cull, Demirgüç-Kunt, & Morduch, 2009, p. 170). This format fits well for business entrepreneurs, but may not be an ideal fit for agriculture.

While the majority of micro loans go out to women, few of them are intended for farming. One discouragement may lie in the repayment structure itself, as it is difficult to make payments on a weekly basis when harvests and profits only come seasonally. More importantly, though, farmers are hesitant to borrow money because of the unpredictability of their occupations; an unexpectedly-small output of crops due to bad weather is hard enough to deal with when farmers do not have to repay loans associated with them, particularly if they depend on some or all of it for food. Worse yet, uncertainty among farmers can even be detrimental during good times, particularly if they did not buy enough seeds early on to take advantage of an above-average rain season (Norton, 2010, p. 78). This is where microinsurance comes in.

Microinsurance is defined as “the protection of low income people against specific perils in exchange for premium payments proportionate to the likelihood and cost of the risk involved” (Cohen & Sebstad, 2005, p. 397). It is to insurance as micro loans are to banking, allowing people with little or no assets to safeguard themselves from calamity. Microinsurance is a particularly new initiative, and so has to first win over the minds of those in poverty before it can become

widespread: whereas even the most uneducated can generally grasp the principal of a loan that needs to be paid back with interest, insurance is a foreign concept to those who are used to being reactionary to disasters and shortfalls. Therefore, it is imperative that educational programs are associated with the implementation of microinsurance.

VI – FOOD REDISTRIBUTION

The World Food Programme (WFP) was established in 1962 with the humanitarian task of feeding the hungry in impoverished nations, and has since grown to become the largest organization of its type. The WFP claims that it feeds over 90 million people per year in 72 countries. It does so first by identifying areas it calls “hunger hotspots”, monitoring them and estimating the number of people in need of food in each location. Some governments provide food directly to the WFP, but the majority of their supplies they buy themselves through the assistance of monetary donations. For the logistics of providing this food to those in need, “on any given day, WFP has 5,000 trucks on the ground, 30 ships at sea, and 70 planes in the air” (Hotspots, 2011). Such a service is of critical importance to addressing food shortages in times of crises, but assuming that this method is a long term solution is naïve at best.

Some scrutiny has been aimed at the integrity of the WFP itself; a recent United Nations report alleges that “collusion between local WFP staffers, Islamist militants, and food transporters” (Economist, 2010) resulted in the loss of half of the food aid sent to Somalia. Instead of reaching starving peasants as intended, the food went into the hands of jihadists that allegedly paid off WFP members. The WFP denied these allegations, but nonetheless has severed ties with two transportation contractors that were implicated in the investigation. Events such as these are not isolated, but often times getting to the truth is a difficult matter, especially in areas as dangerous as Somalia.

Of more concern, however, are the criticisms aimed at the system of food distribution itself. One peculiar claim by the WFP is that there already exists enough food to adequately feed everyone on the planet, and so that solving hunger is simply a matter of distributing it more evenly; while technically true, this argument only holds validity as long as the efficiency of food production continues to increase in pace with population growth. While technological breakthroughs may be pushing back the limits of the productivity of land, these benefits are not currently available or even applicable everywhere, meaning that some regions will continue to fall short of meeting their own subsistence needs while others will be forced to pick up the slack (Holmén, 2006). Therefore, in order to meet the food needs of the future, emphasis must be placed on

distribution *and* continued increases in production, of which sub-Saharan Africa stands the most to gain from.

VII – CLIMATE CHANGE

As global warming threatens to disrupt and change agricultural patterns throughout the world because of increasing average annual temperatures, researchers have sought to figure out if agriculture in sub-Saharan Africa will be able to survive the coming decades. A recent study has focused on the Sahel, a stretch of semiarid land 3,400 miles long and up to 620 miles wide that acts as a buffer between the Sahara desert to the north and the savannas to the south. This fragile ecosystem, in which pastoralists are still a crucial presence, has been observed to have had increasing maximum temperatures coupled with decreasing average rainfall over the past forty years (Abdelkrim, 2011). As the Sahel gets drier and hotter, the desertification of land threatens to push further into the heart of Africa. Quantifying the rate and threat of such change has proven difficult, as “climate models have not in general shown yet a satisfactory reproduction of the observed climate variability of this area, probably due to insufficient understanding” (Abdelkrim, 2011, p. 115) of the process of climate change.

Another study, covering a broader range of African countries, confirms that overall crop yields do suffer with increased temperatures and decreased rainfall. However, it has found that areas which are irrigated have much better chances of surviving these conditions, although they, too, benefit from increased precipitation. In fact, some areas of sub-Saharan Africa which were previously cool have seen *increased* yields from warmer temperatures (Kurukulasuriya et al., 2006). These findings emphasize that some areas are more vulnerable than others to changes in climate, so initiatives must be undertaken that will protect those who are most at risk of losing their crops.

VIII – INTERNATIONAL AND TECHNOLOGICAL INITIATIVES

Some new technologies are changing the way that poverty is addressed in sub-Saharan Africa. KickStart, a non-profit company, sells human-operated pumps that can be used to irrigate land at a fraction of the cost of diesel pumps with similar capabilities. Their latest products, the “MoneyMaker Hip Pump and Super MoneyMaker Pump...have helped launch over 111,800 new businesses, lifted over 500,000 people out of poverty, and are generating \$113 million in new profits annually through agriculture” (Kalan, 2011). Without these pumps, farmers have to rely on rainfall, which offers little more than subsistence yields in

arid regions during the best of times and almost no chance of a successful crop during a drought. Money from the sales of these pumps is used by KickStart to fund further research and development, as their pumps are not without their limitations; the biggest problem with these pumps is often their range, as “only 12 percent of sub-Saharan Africa’s population lives in areas with a water source within 23 feet of the surface” (Kalan, 2011), the current limit of their reach.

In one effort to bring more wells to so many people in need, the H2O Africa Foundation was established. Founded by the crew of the 2007 film *Running the Sahara*, in response to their experience of literally running through the region from its western to eastern coasts, this organization collaborated with numerous others to fund well projects in remote, landlocked areas such as Mali, Niger, and the Central African Republic. While now dissolved into Water.org, an organization that has expanded its scope to provide drinking water to all of the world’s least-developed countries, the H2O Africa Foundation managed to fund dozens of deep well projects in the previously-mentioned countries with the nearly \$400,000 raised following the popularity of the film and endorsement by its sponsors (*Running the Sahara*, 2007).

While getting water to people in sub-Saharan Africa may be the most important phase, it will not be enough on its own to combat starvation. To do just that, Rachel Zedeck has in one promising effort recently founded a for-profit company called Backpack Farm. The idea behind it came to her after observing Sudanese women carry heavy bags of food aid back to their homes. Instead of selling these women ready-to-consume food, she stuffs backpacks full of “indigenous or drought-resistant hybrid seeds, biological crop protection and fertilizer inputs, a water filter, a water tank, a sprayer, drip irrigation equipment and a training manual” (Puro, 2011), all of which is designed to make smallholder farmers much more efficient. The technology going into these backpacks is a collaboration of the research of several institutions, and the services provided by Backpack Farm go beyond it; they provide training seminars that are also available to those who are unable to afford the backpacks, further spreading both education and brand awareness. Zedeck plans to have twenty Backpack Farm distribution and training centers in place by December 2011, and has already served 13,000 farmers since founding her company in 2007 (Puro, 2011).

Some recent efforts to combat food crises have already had measurable results. In response to rising food prices in 2008, Oxfam America targeted marginalized farmers in Ethiopia; after providing them with the food they needed right away, they organized

cash-for-work projects that built dams, rehabilitated springs, and constructed roads, thereby helping people to strengthen their small farms and improve their resilience to future droughts. When drought returned this year, these investments paid off. Instead of needing food assistance,

many of the farm families were able to cope with the harsh weather and look forward to a harvest (Dryden, 2011).

Similar investments in Ghana have cut that nation's rate of famine by an astonishing 75 percent over a twenty five-year period. Additionally, estimates put preventing famines at seven times cheaper than responding to them (Dryden, 2011), making an even stronger case for the continuing global support of such initiatives.

One surprising effort to make African agriculture more competitive has been to capitalize on an emerging demand for native cash crops. Plants such as *Allanblackia* are being planted on a large scale for the first time from Sierra Leone to Tanzania, as their seeds are being harvested and dried for oil extraction (Ochieng, 2007, p. 149). This oil is used as a general vegetable oil and can be put into a variety of products, including soaps and margarine. The United Nations Development Programme expects yields to increase tenfold by 2015, which is when the newly-domesticated trees are expected to mature and begin producing seeds. Additionally, Rooibos leaves are being harvested in Ghana for a growing international market for tea.

Some organizations, such as the Alliance for a Green Revolution in Africa (AGRA), are working toward bringing together initiatives such as those detailed previously in this section. Recognizing that women make up the majority of smallholder farmers in sub-Saharan Africa, and that smallholder farmers produce the majority of food in the region, AGRA has developed a robust plan to empower them. AGRA begins by researching and making available for distribution the seeds of staple, adaptable food crops and fertilizers through various organizations. They then work to increase support systems available to smallholders, including training for soil testing, land usage, and water management. Additionally, AGRA increases smallholder access to financing for the purchasing of seeds, fertilizer, and investing in new technologies. Finally, AGRA implements internal and external monitoring of its organization to evaluate its own performance and accountability (Alliance for a Green Revolution in Africa, 2011). Through efforts like these, unified and well-funded organizations such as AGRA give smallholders their best chances of creating and maintaining outputs levels sufficient to reduce both poverty and hunger in sub-Saharan Africa.

IX – CONCLUSION

The historic success of the balance between African agriculture and pastoralism is long gone in most regions below the Sahara, having been displaced first by colonialism and slavery, and now suppressed by globalization. This is not to say,

however, that farmers should attempt to go back to a simpler or low-tech way of life in order to be competitive. Political and cultural views have been altered to the point of no return, as governments are under little incentive to re-draw borders and men who remain in power are unwilling to cede it to women who, in most cases, may work harder for it. Even if there were an adequate and coherent movement to “go back to the old ways” among Africans, international ties and influences ensure that isolationism could not take hold.

Therefore, to combat the rampant poverty and hunger of sub-Saharan Africa, more initiatives (such as AGRA) must emerge to implement modern technology while planning for the ecological and cultural constraints on each particular region. Picture the following scenario: a startup farmer gets a micro loan and insurance to grow native and/or robust crops, using seeds in a backpack that were selected by international research organizations and a foot pump for irrigation thanks to the new well that was dug near her farm. She could set aside an area of land for grazing by nomadic pastoralists that have been granted international passage in exchange for milk and meat. With enough education and diligence she could become successful enough to expand, and with fair competition she could sell off her surplus and inspire others to follow in her example. The means and potential for such a scenario to take place already exist in sub-Saharan Africa; it simply requires that those with the knowledge and power to better the world pay attention to the big picture and act on it.

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