

## Labor Constraints in the Sub-Saharan Agricultural Market

Professor Mark Long, Cameron Clark,  
and Professor C. Leigh Anderson

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**Evans School Policy Analysis and Research (EPAR)**

*Professor Leigh Anderson, PI and Lead Faculty*

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Labor constraints are generally not identified by the academic community as a significant issue affecting productivity in sub-Saharan African agriculture, except within specific contexts. In particular, labor constraints related to the effects of HIV/AIDS, migration, and the ability of farmers to adopt new technology and management practices have been identified as affecting agriculture productivity to different degrees. A literature on productivity effects from conflict was not found. Labor constraints differ by gender (women tend to be occupied in more household and other unpaid work which reduces their labor supply for paid work) and by country and region, though what follows is a more general overview.

This review is organized into several sections based on the themes in the literature. The first section provides a basic breakdown of the different kinds of agricultural labor in sub-Saharan Africa. The second section provides an overview of the most critical types of labor constraints farmers' face in this region. The section is broken down into ongoing labor constraints such as seasonal labor and emerging labor constraints like HIV/AIDS, migration, and technology. The third section delves into the areas where labor constraints affect agriculture, such as cropping decisions and productivity. We conclude with citations and full abstracts for the most relevant articles used in this review, followed by a bibliography of all sources reviewed. Though labor constraints can be relevant on both the demand and supply side, especially for certain groups such as women and youth, our review follows the literature by focusing on the supply side issues.

The literature reviewed was written between 1990 and 2008, and includes a combination of reports from government organizations and highly cited journal articles.

### **1. Types of Labor in Sub-Saharan Africa**

There are three primary types of agricultural labor in sub-Saharan Africa: family labor, exchange labor, and hired labor. Family labor is the most common and most important source of agricultural labor in SSA, but is not always available in the right quantity or at the right time. In these cases, labor is found outside the household. While the numbers are difficult to quantify because seasonal labor is often hired in a piece meal manner throughout periods of high demand, it has been estimated that over 50% of agricultural workers in Ghana and Kenya use some form of hired labor

(Duncan & Howell, 1992 as cited in Leavy and White, 1999). In some cases, household labor is allocated outside of agriculture because of other available income generating activities (Enete, Nweke, & Tollens, 2003). If the family unit is unable to provide sufficient labor to meet the agricultural needs of the farm, the farm operator supplements through exchange or hired labor.

Exchange labor, sometimes referred to as labor parties or groups, has historically been a common strategy for resource poor households to meet their labor demands. These exchanges are recruited through social networks and constituted under the assumption that the labor will be exchanged until the required task is completed on all land held by the participating parties. An alternate type of exchange labor uses a celebration methodology, whereby local laborers work for free and participate in a celebration hosted by the landholder. It is expected that the landholder will also participate in other parties, but this reciprocity sometimes breaks down if there are class or income disparities between people hosting the parties (Ponte, 2000).

In most areas, labor exchanges are hypothesized to be in decline for two primary reasons. First, community breakdown has contributed to a weakening of labor exchanges, as family members spend increasing amounts of time working off of the farm and have less time to recruit and organize labor exchanges. Second, market liberalization, which has induced farmers to produce crops quickly to meet market demand, has transformed the rural market from one of social negotiation (exchange labor) to a contract environment where farmers must formally hire non-family labor for a set fee (Enete, Nweke, & Tollens, 2003; Alwang & Siegel, 1999).

There is evidence that hired labor is becoming more prominent as competing non-farm employment has made labor exchanges more difficult to organize and drawn household members away from the farm (Ponte, 2000). However, hired labor is used mostly by relatively more prosperous farmers, as poor households become net suppliers of labor (Leavy & White, 2000). The hired labor market is seen as increasingly important as the FAO estimates that 50% of the expected crop yield increases necessary to reverse the decline in per capita food output in sub-Saharan Africa will depend on an increase in purchased units such as labor, fertilizer, seeds, and tools (Enete, Nweke, & Tollens, 2003).

## **2. The Most Critical Types of Labor Constraints**

The literature identified several constraints to labor supply, some of which are interrelated. The first part of this section examines seasonal labor constraints confronted by sub-Saharan farmers. The second part of this section discusses three emerging constraints: HIV/AIDS, technology adoption and migration.

### Ongoing Labor Constraints: Seasonal Labor Constraints

Though the demand for agricultural labor varies across the year or season, in any one area with a concentration of similar crops, the timing across farmers tends to be covariant. Depending on the crop and technologies available, common peaks in demand occur during the planting and harvesting

season, and seasonal labor constraints have become increasingly difficult to manage as household compositions shift and small farmers continue to diversify their earnings through off-farm employment. Alwang and Siegel (1999)<sup>1</sup>, in their study on labor shortages in Malawi smallholder farms<sup>2</sup>, found that multiple constraints including a lack of income and food security led households to a suboptimal allocation of their labor resources during crucial farming periods. The size of typical landholdings was too small to ensure food security and household members were forced to seek off-farm employment to supplement their wages. These activities led households to neglect crucial farming duties during important farming periods (such as weeding and timely planting), reducing yields and encouraging a shift to planting low value food. To the extent that household incomes fell (with off-farm activities unable to compensate for lower on-farm returns), farmer's ability to purchase inputs for the following season declined, inducing landholders to seek more employment off-farm (generally as casual laborers). White, Labarta, and Leguia (2005) cited similar market failures in terms of capital constraints for meeting peak season labor demand. Additionally, they found labor supply relatively inelastic during peak season, that is, the quantity of labor supplied did not rise much even when wage offers rose.

The most significant cause of seasonal labor shortages for rural sub-Saharan African households arises from activities to increase income diversification. Bryceson (2000) discussed how modern rural household members normally pursue several different non-agricultural income generating activities simultaneously. These activities were often opportunistic in nature and many household members, not just the male head of household, participate. Reardon et al. (2007) attribute the labor shift from agricultural to rural non-farm income (RNFY)<sup>3</sup> to the following:

- RNFY typically far exceeds farm-wage labor income.
- Periodically, poor farming seasons (due to external events) push farmers into off-farm employment to cope with high losses.
- Long term structural changes such as farmland degradation, market changes, and droughts that occur with increasing frequency and/or severity push farmers to seek off-farm employment to smooth income.

In addition to household income diversification, seasonal labor shortages can also be caused by the farming climate and type of farming. Speanza, Kiteme, & Wiesman (2008) found that seasonal labor shortages were cited as a major concern for 16% of the households they surveyed in Kenya, and were more prevalent in the semi-arid regions than in areas with higher agricultural potential. Due to dry conditions, many households in these climates self-insured through off-farm employment and attempted to meet their agricultural labor needs through exchange labor groups. The study found a

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<sup>1</sup> This study investigated the sources of scarcity of labor and land in Malawi for a representative smallholder groups. The farmers in the sample averaged about 1 hectare of landholdings with only a median .6 hectares cultivated. The study primarily attempted to discover why small holders plant low value staple crops, which decreases their food security.

<sup>2</sup> Smallholder has varying definitions, oftentimes cited as a farmer who has no more than 10 hectares of land.

<sup>3</sup> Reardon designation, he also designated Rural Non-Farm Economy as RNFE

strong association between households with individuals engaged in off-farm work and those that experienced significant labor shortages during peak farming periods. The problems were exacerbated during peak harvest seasons when there was an increased need for labor to properly harvest and store the crops.

### Emerging Labor Constraints: HIV/AIDS, Migration and Technology

Three emerging constraints have the potential to affect labor supply and quality in sub-Saharan agriculture: the effects of HIV/AIDS, migration to urban areas, and new agricultural technologies. These constraints reduce overall labor supply and demand and, in the case of HIV/AIDS and migration, change the balance of skilled and unskilled agricultural labor.

#### *HIV/AIDS Impacts*

The affect of HIV/AIDS in sub-Saharan Africa on agricultural labor supply, particularly the demographics of the male labor supply, could have long-term impacts on agricultural productivity. By 2010, the U.S Census Bureau predicts that five countries in sub-Saharan Africa will be experiencing negative population growth rates.<sup>4</sup> In the seven countries with the highest HIV rates, it is projected that by 2025 there will be only 20 million men in the wage age years (20 to 59 years of age) rather than the 31.5 million projected in a no-AIDS scenario (US Census Bureau, 2002, as cited in Jayne, Villareal, Pingali & Hemrich, 2005). Within agriculture, HIV/AIDS is often described as having caused reductions in the total area under crop cultivation, shifts towards less labor intensive crops such as cassava or sweet potatoes, reductions in weeding, less availability of capital for agriculture as funds are diverted towards funeral and other expenses, and declining agricultural production due to mortality and loss of household income (Jayne, Villareal, Pingali & Hemrich, 2005; De Guerny, 2002). Jayne, Villareal, Pingali, and Hemrich emphasize that these cited effects have yet to be rigorously tested and many of the existing studies have significant methodological concerns. Additionally, the article predicts that even in the most afflicted countries the labor supply will not grow, but is also unlikely to shrink by 2025 as the number of working age male and female household members (20-59 years old) grows slightly while the population under 20 years old shrinks, primarily due to increased infant mortality. Because of these changing demographics, the authors predict that skilled labor might become more expensive, but agricultural labor is likely to meet any upward pressure on wages with reverse urban-rural migration (covered in the next section).

As the impact of HIV/AIDS is felt, human energy is seen as a critical labor constraint for some African farmers involved in labor-intensive farming. In Kenya, Bishop-Sambrook (2003) found that human power was the principal source of labor for farm operations in sub-Saharan Africa. Sickness from HIV/AIDS forced many farm households to allocate energy to care for sick family members. Once a family member died, grandparents and orphans generally headed the household. Thus,

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<sup>4</sup> The five countries are Botswana (-2.1 percent), Mozambique (-0.2 percent), Lesotho (-0.2 percent), Swaziland (-0.4 percent), and South Africa (-1.4 percent).

resource poor households relied increasingly on labor exchanges and the use of draught power to supplement the lost human energy. Nonetheless, food security was weakened for resource poor households and production was scaled back to compensate for the lost labor force. Fox, et al. (2004) found that Kenyan agricultural workers who suffered from AIDS symptoms harvested 15% less than their peers. This number was likely higher when accounting for reassignment of some duties and work loss from sickness. The FAO (2005) recommended responding to the loss of human energy and labor through the promotion of credit programs and labor saving technologies.

### *Migration*

Intra-rural and rural-urban migration is considered the dominant patterns of migration within sub-Saharan Africa, and can affect household farming decisions and agricultural production levels. Sub-Saharan African urbanization rates (the rate of growth in the urban share of the population) is considered normal in comparison to other world regions, although the absolute growth in urban areas throughout Africa is higher than world averages (Kessides, 2005). The standard theory cited for migration flows is the Harris – Todaro model (1970), which theorizes that migration between rural and urban areas at any given time is dependent on the urban-rural wage differential. Bryceson (1996) and Reardon, et al. (2007) argue that remittances from family members who have migrated to urban areas have become a significant source of non-agricultural income for rural households. While migration can increase the availability of capital in rural areas (Reardon, et al. 2007), it also has the effect of reducing the available labor supply during peak seasons.

Migration is linked to the availability of employment and wages. Therefore, one would expect to see some individuals returning to farm work if prices and overall returns to production rise. This has been documented in Ghana (Canagarajah & Thomas, 1997, as cited in Leavy and White, 2007). Adepoju (2008) argued that a reversal in migration patterns can also be caused by government structural adjustment policies. As one example he cites the removal of marketing boards in Cote D'Ivoire, Mali, Ghana, and Uganda, which had artificially deflated commodity values. A second example was of Burkinabe immigrants returning back to rural areas in Cote D'Ivoire in the 1990s as urban conditions deteriorated. In both of these examples the author cited policies and conditions as catalysts for reverse migration flows. Based on this evidence, it seems likely that the labor constraints caused by migration are potentially reversible contingent on progressive policies that increase farm incomes or changing conditions in the rural or urban areas.

### *Technology Adoption*

In some cases, labor constraints may be exacerbated by the adoption of technology that increases labor demand during peak demand periods. In other cases, technology may not be adopted because it is too labor-intensive, especially for small, resource-poor farm households who find it difficult to hire labor. For example, Byrelee and Heisey (1996) found that the adoption of hybrid maize, fertilizer, and animal traction in several sub-Saharan African studies increased seasonal labor shortages as more intensive harvesting and management became necessary. They also found that

many small farmers rejected some management recommendations, including more frequent weeding, precise plant spacing and fertilizer application, because of their labor intensity. Marennya and Barret (2007) found that the integration of a natural resource management program in Kenya was significantly impacted by the availability of household labor, and the families with less availability could not afford to hire labor and implement the program. Moser and Barret (2002) found a similar impact with the introduction of a rice intensification system in Madagascar. A promising rice method failed because it required greater labor intensity during the time of year when labor output was already high and capital liquidity was low. This was also consistent with the findings of Mafongoya (2006), who found labor availability was a key factor in adoption of practices to improve soil fertility in Southern Africa. Isham (2000), found a similar pattern in Tanzania of increased labor affecting technology adoption, but also found strong relationships between social capital and adoption, and issue that could be impacted by migration.

Conversely, technology has also been shown to alleviate labor shortages by increasing efficiency. Moser and Barret (2003) discuss the recent popularity of new technologies that require few external inputs and are designed to be adopted by resource poor farm households to improve overall yields. Additionally, Sambrook advocates labor saving technologies (LSTs) as a key solution to assist the labor threat from the HIV/AIDS epidemic. These technologies substitute for human power through techniques such as tractor hire services and increased fertilizer use. Other technologies, such as diesel or pedal powered grinding cereal mills in Tanzania, are cited as significantly reducing the need for human power in the processing period (UNIFEM, 1994). Therefore technology adoption is not a labor constraint per se, but the successful adoption of the technology is often dependent on a minimum amount of available labor. It also may depend on how the program is designed to use labor. For example, Steven Haggblade (2009), in his study on conservation farming for cotton farmers in Zambia, found that strict adherence to conservation methods increased productivity 40 to 60% over conventional tillage methods. However, the key to successful adoption was a disciplined workforce and increased availability of off-season labor. Increasing labor in the off-season has major advantages as it relieves the seasonal labor constraint and can permit the farmer to increase it area cultivated.

### **3. Impact of Labor Constraints**

Labor constraints have a variety of potential impacts on sub-Saharan African agriculture, including reduction of agricultural productivity, health impacts on household members, particularly women, and cropping decisions.

There has been a limited amount of evidence linking labor constraints directly to low agricultural productivity levels in sub-Saharan Africa (see Jayne, Villarreal, Pingali, & Hemrich, 2005; Leavy & White, 2000). However, in at least some specific cases, researchers have found evidence linking

labor constraints caused by disease and an increase in off-farm employment to reduced productivity (Tiffen, 2003; Alwang & Siegel, 1999; Elad & Houston, 2001).

In some cases, HIV/AIDS has been shown to significantly decrease productivity in the short run, although this is less clear in the long run (Yamano & Jayne, 2004; Larson, et al. 2004). Larson et al. found that adult mortality among smallholder farmers in Zambia caused a 15% decline in long-term production of cotton and maize. A similar effect was discovered by Yamano and Jayne (2004) in Kenya. Other studies, such as Beegle (2003), have not found conclusive long-term effects of AIDS-related mortality on agricultural production. Rather, this study, which examined mortality-afflicted farm households in Tanzania, found only temporary effects on agricultural production (and no crop shifts) from AIDS mortality because afflicted households were able to draw back labor that had migrated to urban areas.

The effect of HIV/AIDS on the supply of unskilled labor may be unclear, but the impact on skilled labor is fairly well understood. Yamano and Jayne (2004) studied the effects of AIDS mortality on farm households in Kenya and found that the effect of AIDS mortality on crop production was sensitive to the gender, position, and age of the deceased family member. For example, they found that the death of the male head of household between 16 and 59 years of age, representing a majority of household institutional knowledge and agricultural skill, was associated with a 68% reduction in the net value of the household crop production. Effects were less drastic for non-head of household deaths and this was attributed to male head of households having had more knowledge on crop husbandry and marketing of cash crops. Additionally, the study found that grain crops were more adversely affected by female mortality and cash crops were more affected by male mortality.

Off-farm labor and urban migration, strategies used by households to become more food secure and increase their capital (Reardon, et al., 2007) have also decreased the agricultural labor supply, deepening seasonal labor shortages, and lowered both the quantity of area farmed and crop yields (De Guerny, 2002; Fafchamps, 1993; Elad & Houston, 2002). However, while crop output and productivity is affected, the off-farm income sources also generated capital to purchase inputs and new technology. Therefore, income from non-farm activities and remittances not only provides insurance from income shocks and food security, but it also is identified as supporting farm labor and investments (Reardon, 1997). Related, Tiffen (2003) found a pattern in Northern Nigeria of complementary farm investments in cattle and equipment to meet growing food demand from urbanization and seasonal labor shortages.

Responding to agricultural labor constraints may prompt shifts in the gender balance of agricultural work. As more men seek off farm employment in response to economic policies that raise input prices and lower farmgate prices, agricultural tasks are increasingly shifted to female household members, particularly for smallholder farms (Saito, 1994). The shift can be seen both in the number of women participating in tasks that were formerly considered “male tasks” (such as land preparation, seeding, etc.) and in the ratio of women to men working actively on the farm. The

“feminization of agriculture,” has been particularly striking for cash crops, traditionally male-dominated (Lastarria-Cornheil, 2006). This shift has simultaneous positive and negative impacts for women. On the positive side, as they take on more cash crops, and become higher wage earners, they become more involved in household decision making. On the negative side, they generally do not relinquish their other household duties and thus work harder and experience additional health problems (Lastarria-Cornheil, 2006). The feminization of agriculture, however, may simply be a result of better documenting what women’s specific tasks are on the farm, as women have always been involved in farm work but current studies better account for their full role (Fontana & Paciello, forthcoming).

An additional impact to the women’s prominent role in farm labor is the inequality in wages, hours, crop returns. For example, it was found in Ghana that women make 65% of what a male agricultural worker receives and in Tanzania a female worker makes only 69% of what a male receives. Additionally, most females work a considerable number of unpaid hours in household activities and assist in off-farm activities. Lastly, traditional female plots that become marketable are commonly taken over by the male head of household after the transition (Fontana & Paciello, forthcoming). Essentially, women are often critical components of the farm labor force but receive a greatly inequitable share of the benefits.

Seasonal labor shortages also affect the gender balance of farm labor. Traditionally, men were more heavily involved in the land clearing/ preparation process, while women were involved more heavily in the harvest. This can be exacerbated by children attending school, which further reduces the family’s ability to farm intensely (Bishop-Sambrook, 2003). However, in situations where men have been unable to allocate sufficient time and energy to land preparation, this has required increased work from women (Speranza et al., 2008). This had a secondary consequence for cropping decisions, as many households have planted less labor intensive crops to mitigate the inability of the male household members to fulfill their traditional role (Alwang & Siegel, 1999; Elad & Houston, 2001). One example of this type of cropping decision is a switch to cassava, which grows well in dry conditions and can be very productive with a relatively small amount of labor (Enete, et al. 2004)<sup>5</sup>.

#### **4. Conclusion**

It is not clear whether labor constraints are having long-term negative impacts on rural livelihoods in Sub-Saharan Africa. Research has shown a clear increase in the number of households (especially resource poor households) who seek off farm employment to diversify their income streams, which can have a negative effect on the quality and net production of their fields. However, income diversification may also increase food security, permit farm families to purchase critical inputs, and provide increased capital to hire labor. This trend also has intra-household ramifications as women are increasingly taking on more of the agricultural duties, which lowers household yields and may have negative health effects. Therefore, the impacts of the increase in off-farm employment are

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<sup>5</sup> This study covered 6 countries: Cote d’Ivoire, the Democratic Republic of Congo, Ghana, Nigeria, Tanzania, and Uganda.



partially responsible for labor shortages, particularly seasonal, but there is insufficient evidence to conclude that off-farm employment (and migration) affects farm productivity.

The most clear labor constraints identified were the supply shortage for resource poor farmers during labor intensive farming periods, which is exacerbated by illness and mortality from HIV/AIDS, better off-farm wages, and migration to rural areas.

While improved profitability of farming may in at least some cases draw labor back to rural areas, it is clear that HIV/AIDS could be a significant factor affecting the long-term labor supply. The negative population growth rates in some countries and the increase in grandparent and female-led households will likely impact the ability of many sub-Saharan African countries to raise their production levels. This demographic change of the farming family as a result of HIV/AIDS may have a profound impact on skilled and unskilled labor in sub-Saharan African agriculture. A critical factor (along with inroads in HIV prevention and treatment) will be the adoption of new labor-saving agricultural technologies and management practices, but these technologies should avoid increasing labor demands, particularly at peak times, or they may not be adopted.

Meanwhile, the inability of farm operators to find sufficient labor, particularly skilled, may keep them from adopting new technologies and conducting good management practices. This has the potential to inhibit widespread adoption of productivity-enhancing technologies, if not well designed. However, in general, the body of literature regarding labor constraints is rather thin, and labor is cited as only one impediment to increased agricultural productivity, along with lack of capital, lack of inputs, and physical conditions.

The next page lists the citations and full abstracts for the most relevant and well cited articles on sub-Saharan agricultural labor constraints. The articles are listed by year and labeled based on the type of labor constraint discussed in the article/study. A full bibliography follow for the articles reviewed in this paper.

## **5. Literature Review Methodology**

This literature review was conducted using both the Web of Science and Google Scholar (times cited uses Google Scholar). Both search engines have the ability to produce the number of times each article is cited. In addition to the “works cited” search engines, numerous NGO and government websites were searched including the World Bank, USAID, FAO, IFAD, IFPRI and the USDA amongst others.

A number of keywords were searched including but not limited to:

- Labor/labour
- Labor/labour constraints
- Agriculture
- Africa
- Sub-Saharan Africa

- Labor/labour Supply
- Technology adoption
- Productivity
- Conflict/civil war<sup>6</sup>

## Relevant Articles with Abstracts

### Subtopic 1: HIV/AIDS and Labor Supply

1. Jayne, T.S., Pingali, P., & Hemrich, G. (2005). HIV/AIDS and the Agricultural Sector: Implication for Policy in Eastern and Southern Africa. *Journal of Agricultural and Development Economics*, Vol. 2, No. 2, pp. 158-181.

Times Cited: 12

Abstract: This paper draws upon development economics theory, demographic projections, and empirical evidence to consider the likely consequences of the HIV/AIDS pandemic for the agricultural sector of the hardest-hit countries of Eastern and Southern Africa. We identify four processes that have been underemphasized in previous analysis: 1) the momentum of long-term population growth rates; 2) substantial underemployment in these countries' informal sectors; 3) steady declines in land-to-person ratios in the smallholder farming sectors; and 4) effects of food and input marketing reforms on shifts in cropping patterns. The paper concludes that the conventional wisdom encouraging prioritisation of labour-saving technology or crops has been over-generalised, although labour-saving agricultural technologies may be appropriate for certain types of households and regions. The most effective means for agricultural policy to respond to HIV/AIDS will entail stepping up support for agricultural science and technology development, extension systems, and input and crop market development to improve the agricultural sector's potential to raise living standards in highly affected rural communities. Agricultural productivity growth may also help to overcome poverty related factors that may interact with the disease to magnify its effects.

Subject Areas: Aids, Productivity

2. Yamano, T. & Jayne, T.S. (2004). Measuring the Impacts of Working Age Adult Mortality on Small Scale Farm Households in Kenya. *World Development*, Vol. 32, No. 1, pp. 91-119. (AIDS, productivity)

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<sup>6</sup> A search was done for labor constraints and civil conflict through these mediums and, while there is considerable literature on the impacts of conflict on agriculture in SSA, it is primarily focused on the destruction of fertile land and equipment. Thus, it was not included in this review.

Times Cited: 105

Abstract: Using a two-year panel of 1,422 Kenyan households surveyed in 1997 and 2000, we measure how working-age adult mortality affects rural households' size and composition, crop production, asset levels, and off-farm income. We also use adult mortality rates from available data on an HIV-negative sample to predict the proportion of deaths observed during 1997–2000 due to AIDS. Difference-in-differences estimations indicate that the effects of adult mortality are highly sensitive to the gender and position of the deceased family member in the household and to the household's initial asset levels. Results indicate that relatively poor households do not recover quickly from head-of-household adult mortality; effects on crop and nonfarm incomes do not decay at least over the three-year survey interval.

Subject Area: Aids, Productivity

### Subtopic 2: Seasonal Labor Constraints

1. Speranza, C.I., Kiteme, B., & Wiesmann, U. (2005). Droughts and Famines: the underlying factors and causal links among agro-pastoral households in semi-arid Makueni district, Kenya. *Global Environmental Change*: 18, pp. 220-233. (productivity, intrahousehold, farm vs. off farm)

Times Cited: 3

Abstract: Famines are often linked to drought in semi-arid areas of Sub-Saharan Africa where not only pastoralists, but also increasingly agro-pastoralists are affected. This study addresses the interplay between drought and famine in the rural semi-arid areas of Makueni district, Kenya, by examining whether, and how crop production conditions and agro-pastoral strategies predispose smallholder households to drought-triggered food insecurity. If this hypothesis holds, then approaches to deal with drought and famine have to target factors causing household food insecurity during non-drought periods. Data from a longitudinal survey of 127 households, interviews, workshops, and daily rainfall records (1961–2003) were analyzed using quantitative and qualitative methods. This integrated approach confirms the above hypothesis and reveals that factors other than rainfall, like asset and labor constraints, inadequate policy enforcement, as well as the poverty-driven inability to adopt risk-averse production systems play a key role. When linking these factors to the high rainfall variability, farmer-relevant definitions and forecasts of drought have to be applied.

Subject Areas: Seasonal Labor Constraints, Productivity

2. Alwang, J. & Siegel, P.B. (1999). Labor Shortages on Small Landholdings in Malawi: Implication for Policy Reforms. *World Development*, Vol. 27, Iss. 8, pp. 1461-1475. (farm vs. not farm, productivity, seasonal constraints, also listed in supply)

Times Cited: 44

Abstract: Seasonally-specific cultivation patterns of farm crop enterprises often create periodic labor shortages. New technologies that require labor inputs during such labor-scarce seasons are less likely to be adopted. Financial ex ante assessments of technology alternatives, however, neglect the implications of seasonal labor shortages. Standard returns to labor estimates assume that the value of labor to farmers is constant despite temporary increases in demand. This paper develops an alternative measure, returns to opportunity-costed labor (RTOCL), which discerns the seasonally-changing costs of labor. RTOCL more accurately reflects farmer decision criteria and serves as a useful measure in ex ante analysis of technology interventions. A case study of a bush fallow agricultural system in the Peruvian Amazon illustrates how seasonal labor shortages lead to farm management tradeoffs that affect the prospects of technology adoption. Two improvements of a new upland rice variety are contrasted: higher yield versus early maturity. Empirical results of an agro-economic mathematical model reveal that the early maturity characteristic enables rice to become more complementary to peak-season labor demands of the agricultural system. This early maturity characteristic permits farmers to cultivate larger areas and reap greater financial benefits than a variety with a high yield characteristic. Model results support the need to address heterogeneous seasonal labor demands when developing and disseminating agricultural technologies intended to benefit resource poor farmers.

Areas Covered: Seasonal Labor Constraints, Productivity

### Subtopic 3: Urban Migration and Off Farm Income

1. Ponte, S. (2000). From Social Negotiation to Contract Shifting: Shifting Strategies of Farm Labor Recruitment in Tanzania Under Market Liberalization. *World Development*, Vol. 28. No. 6. Pp. 1017-1030.

Times Cited: 13

Abstract: This paper highlights some of the contradictions and idiosyncrasies of agricultural market liberalization in Africa through the case study of Tanzania. Based on qualitative research and survey data collected in the country in 1995–96, this article suggests that one of the results of economic reforms has been a passage from social negotiation to contractual negotiation as the main vehicle for access to resources. Research findings show that farmers have shifted from recruiting farm labor through social networks to recruiting hired farm labor, and that socioeconomic inequality is increasing. The author concludes that farming households are becoming more vulnerable to natural and economic shocks, and calls for policy solutions to address these problems.

Areas Covered:

2. Sender, J., Cramer, C. & Oya, C. (2005) *Unequal prospects: disparities in the quantity and quality of labour supply in sub-Saharan Africa*. Working Paper. World Bank Social Protection Discussion Paper Series; No.0525. (Productivity, also listed in demand)

Times Cited: 4

Abstract: Not all relevant policies can be discussed. For example, countries "severely affected" by HIV/AIDS will need to adopt a different range of policies towards labour supply from countries with lower prevalence rates, but the details of preventive and curative policy options are not explored. The paper describes the complex effects of violence and violent conflicts on many aspects of labour supply, but does not discuss post-war reconstruction policy initiatives, or interventions to reduce conflict. And policies that influence the demand for labour will have dramatic dynamic effects on the quantity and quality of labour supplied but are largely ignored in this paper. Historically, when demand for labour has been strong in Sub-Saharan Africa labour inputs have responded in a number of ways. Participation rates have increased; and labour migration has risen in response to demand for imported labour. It is also well-known that rising demand for labour generates improvements in the quality of the labour force, through learning-by-doing processes and static and dynamic returns to scale. This paper is not concerned with the detailed analysis of appropriate macroeconomic strategies to achieve the level of demand required for rapid growth. The paper does, however, examine some of the barriers that workers in different countries currently face in responding to changing demand conditions in the labour market. These include transport and other barriers to labour mobility (Section 5); the structured disadvantage experienced by women and certain other categories of worker (Section 2); the inadequacy of information, communication and money transmission facilities available to workers (Section 5); and government policies that are, to different degrees in different economies, limiting some workers' access to the basic education, primary health care and the negotiating skills that are required for advantageous participation in labour markets (Sections 2-4).

Areas Covered:

#### Subtopic 4: Labor Constraints and Technology Adoption

1. Moser, C.M. & Barret, C.B. (2003). The disappointing adoption dynamics of a yield-increasing, low external-input technology: the case of SRI in Madagascar. *Agricultural Systems*, Vol. 76, pp. 1085-1100. (technology adoption, productivity, also listed in supply)

Times Cited: 56

Abstract: Low external-input agricultural technologies are commonly developed for and promoted in poor rural areas of the developing world because they are presumably more appropriate for farmers who may not have the access or ability to adopt methods requiring significant purchased inputs. The System of Rice Intensification (SRI), a low external-input (LEI) technology, has received a fair amount of attention in recent years both in and outside of Madagascar, where remarkable yield increases have been achieved in a country where most farmers are unable to grow enough rice to feed their families. Despite its promise, we find that SRI is difficult for most farmers to practise because the method requires significant additional labor input at a time of the year when liquidity is

low and labor effort is already high. While SRI may be unique for its dramatic yield increases and relative complexity, the highly seasonal, labor-intensive nature of SRI is common to many LEI technologies, calling into question the common assumption of the appropriateness of such technologies for smallholders.

Areas Covered: Technology Adoption

2. White, D.S., Labarta, R.A., & Leguia, E.J. (2005). Technology adoption by resource-poor farmers: considering the implications of peak season labor costs. *Agricultural Systems*, Vol. 85, pp. 183-201.

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Abstract: Seasonally-specific cultivation patterns of farm crop enterprises often create periodic labor shortages. New technologies that require labor inputs during such labor-scarce seasons are less likely to be adopted. Financial ex ante assessments of technology alternatives, however, neglect the implications of seasonal labor shortages. Standard returns to labor estimates assume that the value of labor to farmers is constant despite temporary increases in demand. This paper develops an alternative measure, returns to opportunity-costed labor (RTOCL), which discerns the seasonally-changing costs of labor. RTOCL more accurately reflects farmer decision criteria and serves as a useful measure in ex ante analysis of technology interventions. A case study of a bush fallow agricultural system in the Peruvian Amazon illustrates how seasonal labor shortages lead to farm management tradeoffs that affect the prospects of technology adoption. Two improvements of a new upland rice variety are contrasted: higher yield versus early maturity. Empirical results of an agro-economic mathematical model reveal that the early maturity characteristic enables rice to become more complementary to peak-season labor demands of the agricultural system. This early maturity characteristic permits farmers to cultivate larger areas and reap greater financial benefits than a variety with a high yield characteristic. Model results support the need to address heterogeneous seasonal labor demands when developing and disseminating agricultural technologies intended to benefit resource-poor farmers.

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*AIDS* – article discusses AIDS as impacting agricultural labor (these articles can also have intra-household dynamics).

*Farm vs. non-farm* – article discusses farmers diversifying income through off farm employment.

*Migration* – article discusses migration (generally to urban areas) as impact agricultural labor.

*Productivity* – article discusses labor constraining production levels.

*Technology adoption* – article discusses labor constraints impacting agricultural technology adoption.

*Seasonal Constraints* – Labor impacted by seasonal shifts in demand.

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