Some Ideas on Mechanization as a Development Strategy to Respond to Declining Availability of Farm Labor Due to HIV/AIDS and Migration to Cities in Africa

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Labor-intensive agricultural production is more vulnerable to the negative effects of HIV/AIDS than is more capital-intensive, mechanized agriculture.

The strategy of supporting improvements and wide dissemination of improved implements of cultivation to be used with animal traction and, to the degree possible, tractors taking energy from the internal combustion engine can compensate for loss of farm labor due to HIV/AIDS. Industrialized countries compensated for the increasing lack of labor on the farm by progressive mechanization of agricultural production as people migrated to the cities. In the developing world, reduction of the rural workforce as a result of both HIV/AIDS and migration to the cities points to the need for increasing mechanization of agricultural production.
The following pairs of photos show great contrast between labor-intensive and mechanized agricultural production.

The *productivity* of the labor-intensive activities depicted is highly vulnerable throughout the African continent due to three major factors—HIV/AIDS and migration of rural people to the cities and the lack of widely available technologies.
Sorghum can be produced with much labor and little capital . . .

. . . or with less labor and more capital . . .
HIV/AIDS and Mechanization of Agriculture

Tilling the soil for the early rains and wheat production, Amhara Region, Ethiopia, 2000

Advertisement for 255-hp tractor with “all new ActiveSeat™ which further enhances your ride by isolating you from as much as 90 percent of vertical seat movement. True breakthroughs in suspension technology.” USA, 2001
HIV/AIDS and Mechanization of Agriculture

Collecting harvested pearl millet for food in the Sahel, West Africa

Collecting harvested sorghum in Riley County, KS, 2001
HIV/AIDS and Mechanization of Agriculture

Threshing wheat for food near Saly village, S. Gonder, Amhara Region, Ethiopia, 2000.

Harvesting and threshing sorghum for cattle feed in Nebraska
HIV/AIDS and Mechanization of Agriculture

Harvesting wheat for food by sickle, or reaping hook near Saly Village, S. Gonder, Amhara Region, Ethiopia, 2000

Harvesting wheat in the USA
Considerable research to increase the efficiency of the traditional implement of cultivation in Ethiopia, the maresha plow, has been conducted by agricultural scientists at the Nazret Agricultural Research Center of the Ethiopian Agricultural Research Organization at Melkassa, Ethiopia. A glimpse at some of the results of their many years of work can be found at

http://intsormil.org/powerpoint/melkassa_implements.ppt

The results of the implement research at Nazret Agricultural Research Center are an excellent example of the application of science to increase the efficiency of on-farm labor. That kind of practical, cost-effective technology could be widely disseminated by training fabricators in-country and making the inputs to production of such implements available at affordable cost.
A brief overview of draft animals in Ethiopia and the results of some of the innovative research on animal traction and improved implements for cultivation done in Ethiopia at the Nazret Agricultural Research Center of the Ethiopian Agricultural Research Organization are reported in Draught Animal News:

http://intsormil.org/powerpoint/draught_animal_news_articles.ppt
The following information shows how, during the last 170 years or so, mechanization of harvesting grain crops—cutting, threshing and transporting grains—has proceeded in the United States. A similar progression—or selective application of appropriate technologies in that progression—in the use of technologies can be implemented in Africa in response to declining availability of labor to produce food, should policymakers in Africa and in development agencies of industrialized countries, as well as the private sector, choose to commit to accelerating mechanization of agriculture in Africa.
Technology Development

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Use of Power from Animal Traction and the Internal Combustion Engine

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Harvesting, Threshing and Collecting Cereals in the United States
Sickle, or reaping hook. One man cuts 0.5 – 1.0 acres/day.

Cradle, 1776-1840. One man cuts 2 acres/day.

Scythe. One man cuts 3 acres/day.

This McCormick reaper of 1831 shows the wide master wheel which carried most of the weight of the machine and, through ground transaction, supplied power to operate the reel and the reciprocal knife. The world's first reaper incorporated seven basic principles which have ever since been found essential in virtually all grain-cutting machines. While this first machine required only 2 people for operation (a person to ride the horse and a man to rake the cut grain from the platform), it cut as much grain in one day as 4-5 men with cradles or 12-16 men with reaping hooks.

Source: http://www.vaes.vt.edu/steeles/mccormick/harvest.html#patent
HIV/AIDS and Mechanization of Agriculture

The first combine was invented by Hiram Moore in 1838. It took several decades before the combine came into wide use. Early combines were driven by as many as 16 or more horses.

Why has this technology been improved and accepted in some countries but not in others?

HIV/AIDS and Mechanization of Agriculture

McCormick Patent Reaping Machine, 1852-1865

McCormick Patent Reaping and Mowing Machine, 1852-1865

McCormick Automatic Self-Rake Reaper, 1858-1875

McCormick "Advance" Combination Reaper and Mower, 1869-1879

McCormick Marsh Type Harvester, 1875-1883

McCormick Harvester and Binder, 1877-1885

Source: http://www.vaes.vt.edu/steeles/mccormick/harvest.html#patent
McCormick Harvester and Binder of 1876. 50,000 of these binders between 1877 and 1885.

The McCormick-Deering Tractor Binder with PTO

McCormick-Deering Harvester-Thresher cuts 40-50 acres/day and threshes, cleans and stores the grain, placing it in a grain tank

Windrow-Harvester cuts grain and leaves it in a windrow on top of the stubble for later, mechanical threshing.

http://www.vaes.vt.edu/steeles/mccormick/harvest.html
A man in a modern combine can harvest large areas in a day.
One doesn't jump quickly from harvesting with the sickle, or reaping hook, to the massive combines used today in the United States. Development of mechanization in developing countries can, however employ technologies developed during the 170-year transition from the sickle to the combine in the United States. Now may well be the time to accelerate mechanization of agriculture in Africa. Millions of people could benefit.