

UNLOCKING ETHIOPIA'S AGRICULTURAL POTENTIAL THROUGH ENTREPRENEURSHIP AND APPROPRIATE TECHNOLOGY TRANSFER

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Agriculture is arguably the most effective way to reducing poverty, having twice the potential to reduce poverty than non agricultural sectors. This is largely because 75 percent of the World's poorest populations live in the rural areas where agriculture is the main economic activity. Agriculture has contributed immensely to poverty reduction and economic growth in China and India. In Africa, Ghana stands out, having reduced poverty by about 24 percent over the last 15 years and this achievement is partly attributed to a robust agricultural sector (WB, 2008). Thus agriculture is finding new meaning in development (ODI, 2013). This is why Africa should put more investment in agriculture as majority of their poverty stricken lives in the rural areas. Approximately 60~70 percent of its 800 million population lives in the rural and 70~80 percent live on less than \$ 1 a day (Maatman et al). But it goes without saying that Africa has a great agricultural potential, owing both to its vast idle but rich land and a young population capable of providing cheap farm labour. In fact owing to this potential, Africa Development Bank (ADB) has placed agriculture as one of its key long term growth strategies for realizing the dream of a self sufficient Africa (ADB website). Currently Africa's productivity is just 25 percent of the global average and much of its arable land is used with backward technology and techniques. Hence despite the vast potential, African countries are often severely hit by food insecurity. The scale of famine witnessed in the horn of Africa, especially in Ethiopia and Kenya is dreadful, yet these countries are predominantly agricultural.

As a land locked country, Ethiopia covers 1,200,000 square kilometers. Small holder peasant farmers cultivate 95 percent of farm land (FAO, 2006) and 43 percent of its GDP comes from agriculture. In terms of international trade, 90 percent of its exports are agricultural. This is why the government allocates at least 15 percent of the country's budget to agriculture. Moreover Ethiopia has adopted

industrialization led agriculture. Agriculture is its second biggest source of income; 80 percent of the population is employed in the agricultural sector, with 25 percent of the rural poor earning a living from agriculture (MoARD, 2010). Ethiopia is also the largest coffee producer in Africa and produces some of the finest coffees for the world market. It ranks first in livestock production in the continent and tenth in the world. It is endowed with a favorable tropical climate and moisture that favors the growth a variety of crops. Generally, Ethiopia has a high potential for crop diversification, and therefore can support diversified eating habits. Almost 50 percent of its land is arable (Adenew B., 2009).

Major crops grown in Ethiopia are cereals- maize, teff, barley, sorghum and wheat. Nonetheless, non grains: pulses, oil crops, roots and plantation crops have more industrial and food use (FAO, 2006). Most of the country's forest highlands are very fertile. The use of falling forest leaves as fertilizer means low use of chemical fertilizers. Thus Ethiopia has the ability to produce cheap and more nutritious foods. This factor should improve the country's competitiveness in the global market. However, majority of soils lack nutrients necessary to support high yields of crops. Moreover, erosion is high due to human capacity and soils have been degraded due to many years of cropping without protection. Even though the land tenure in Ethiopia guarantees the rights to own and use land, periodic redistribution of lands is a disincentive to proper land management and erosion control by small farm owners (FAO, 2006).

Ethiopia mainly depends on subsistence, rain fed agriculture which is occasionally disrupted by severe droughts in the horn of Africa. Such droughts are usually occasioned by a devastating loss of livestock, human life, malnutrition and health and hygiene scares. There is low input and low output in Ethiopia's agriculture, whereby only small scale irrigation is practiced by smallholders (FAO, 2006). As a result, food insecurity is very high among the rural poor, some of whom depends on social safety nets such as food aid and cash transfers. At least 30 percent of its 90 million populations live below national poverty line, the rural households being the poorest earning less than \$0.50 a day (MoARD, 2010). But historical evidence shows that food aid hasn't provided a lasting solution to food insecurity. The answer lies in improving agricultural productivity and production and shifting from the subsistence to market oriented commercial agriculture.

The Ethiopian government has made tremendous investments in agriculture. However, a number of challenges still bedevil the sector: lack of fertilizer, limited access to credit and periodic severe droughts (FAO, 2006). Furthermore, the Ethiopian farmers lack appropriate technology to produce, process, manage, distribute, and market commodities in the right quality and quantity demanded. For example, even though Ethiopia produces some of the best coffee in the world, most of it is exported unprocessed. Only about 8 percent of farmers have received advice on agro-processing. Thus most of

them are neither involved in agro-processing or value addition due to lack of appropriate technology (Mutimba, 2011). This means the country does not get value for its produce; hence most of the farmers continue to languish in poverty. These problems also affect producers of oils, fruits, vegetables among others.

Therefore, the adoption of appropriate technology for small scale agro-processing can significantly improve the economic fortunes of smallholders in Ethiopia. The focus should be to provide appropriate agricultural machinery that is labour intensive but affordable to the farmer.

A few African countries like Mali adopted appropriate agro-processing technology and have registered remarkable progress in the affected produce. But it would be wrong to suggest that such efforts do not exist in Ethiopia. For example, the country already has appropriate technology for simple threshing machine in some regions. However, the equipment is too expensive and has too much capacity to be used by one farmer (Saasakawa Africa Association, SAA). More work should be done to scale up such technologies, with emphasis on the availability and affordability of the equipment to the smallholders. The increased availability of such equipment must be complimented by improved access to financial services such as availability of affordable credit to the smallholders. At the present access to credit by smallholders remains a challenge (FAO, 2006). The farmer cooperatives can be instrumental in helping their members to acquire the appropriate technology equipment at affordable prices. Moreover, the government has liberalised agricultural sector (MoARD). This makes it possible for foreign investors and local manufacturers to partner to sustainably produce and maintain cost effective agro-processing equipment. The initiative of the SAA which organizes Ethiopian women into agro processing groups to help them realize value addition to their produce and improve their income is one positive step that should be supported by foreign investors. These efforts will not only help to empower the rural poor women to improve their food security, but will also integrate into the mainstream economy the women who are currently discriminated in agricultural sector.

But when designing and manufacturing appropriate technology equipment it is important to consider acute energy shortage in Ethiopia and unemployment issue. Presently Ethiopia depends mainly on biomass and other wastes to produce energy which meets only 10 percent of national demand. But access to electricity remains at a mere 2 percent in the rural areas (energypedia). Poverty rate is also high in those rural areas. This means that the appropriate technology to be adopted must be energy efficient, less capital intensive and thus sustainable in the long run. The coffee culpero machine presently found in Guatemala is such example; the machine uses bicycle power to separate the coffee fruit from beans and is simple to operate, time saving and requires no specialised skills. In addition, one must bear in mind that in Ethiopia agriculture is the biggest employer to the poor as it requires

low level of education. Less labour intensive equipment can result into massive unemployment such witnessed in Brazil and Bolivia (WB, 2008). Should Ethiopia adopt less labour intensive technology, it must develop its current underperforming industrial sector into a dynamic and expanding sector to absorb surplus rural labour. Thus Ethiopia would do better following a two thronged approach: ‘agriculture and industrialization at the same time’ adapted by Korea in its early development stages.

Furthermore, Ethiopian farmers needs support for appropriate pre and post harvest skills for handling the produce, including storage, transportation, sorting and grading and market linkages or information. (Mutimba, 2011). Sadly even the field extension officers suffer the same deficiency of appropriate technology, knowledge and skills (Adenew B., 2009). According to MoARD, 15~20 percent of grains are lost due to poor pre harvest practices, including pest and diseases, while another 30 percent is lost due to post harvest practices. Apparently, future technical cooperation that addresses these issues can be meaningful in improving farmer’s understanding of the entire value chain to enhance value adding technologies.

Quality enhancing harvesting techniques should ensure that crops like fruits are appropriately harvested, packed and transported. Smallholders need training on appropriate harvesting techniques that preserve the quality of the produce. In Afghanistan for example, Chemonics International trained farmers on modern harvesting and post harvesting techniques, including packaging fruits and vegetables. The results were an impressive improvement of produce quality and competitiveness in global market (USAID, 2011). These techniques can be easily replicated in Ethiopia with great success.

It is lamentable that only about a third of Ethiopia’s produce reaches the market (UNDP, 2010). This implies that most smallholder farmers employ poor storage or transportation means for the produce. For example the practice of packing a produce like fruits in woven sacks, as commonly used in Africa causes bruises on the fruits and hence rejected during grading. Similarly, deep plastic containers without ventilation damage the fruits and vegetables at the bottom because of too much weight from the top. Furthermore, Ethiopian farmers must avoid transporting fruits under heat, or transporting agricultural produce in vehicles used to transport other goods. The use of appropriate harvesting equipment such as wooden ventilated crates can improve both quality and quantity of produce that reaches the market (Nenguwo, 2000). In Rwanda the use of appropriate technology for storage drastically improved the quality of produce that smallholders export. Its wooden evaporative cooler, made from wood, sand and water has improved income for many of its smallholders.

With regard to market access the government has done good work in physical infrastructure, though more still needs to be done in remote areas. Most challenges concern information dissemination on price factor, market organisation and linkage. In fact most farmers operate with very limited

information. Evidence shows that in cases where smallholders have surpluses, market access remains a major barrier to improved income (MoARD). Market Information system is a challenge for obvious reasons: Ethiopia has the lowest mobile phone density in Africa, with only about 2.5percent mobile phone penetration rate compared to the 70 percent average in Africa. It has only one mobile phone operator- EthioTelecom (ETC). Internet access is slow and expensive, while mobile phone prices are still high compared to neighbouring country like Kenya (The economist). Therefore most smallholder farmers in Ethiopia cannot access Information Communication Technology (ICT) services due to cost barrier. The deficiency in Ethiopia's ICT, ignores the appreciation that mobile phone plays an important role in market access, information dissemination and job enhancement (WB, 2008). In fact mobile phones are the most used devices in informal businesses (Deen et al., 2013). There is need to liberalise the ICT sector to spur competition and lower the cost of communication. Equally important will be increased availability of affordable second hand mobile phones. Innovations that include more use of vernacular radio stations and short text messaging system will significantly improve information dissemination. On the other hand producer cooperatives should improve farmers' bargaining power and competitiveness.

But a holistic approach to Ethiopia's agricultural sector must extend to linking smallholders to markets both locally and internationally. Partnership through international cooperation can lead efforts in showcasing Ethiopia's agricultural produce in international trade fairs. Local exporters should also be trained on how to negotiate and forge deals, then linked to international buyers.

On the issue of improving Ethiopia's agricultural productivity, the use of inappropriate farming techniques coupled with increasing population is already a threat to the ecosystem in Ethiopia. Fertilizer manufacturing and distribution presently falls short of meeting the demand (MoARD). However, agricultural productivity as known today cannot be increased without sustainable use of fertilizer (ADB, 2007). In view of Ethiopia's ever growing population, there is a risk of 'soil mining' as the size of farm land is reduced per person, forcing farmers to reuse the same piece of land over time. In this regard integrated soil fertility management technology should be an appropriate approach in improving and sustaining the country's productivity. This technology seeks to recycle soil nutrients and water, adopt conservation farming through context specific soil erosion control and promote appropriate use of organic and inorganic fertilizer (WB, 1995).

It is worth noting that the Ethiopia has a big potential for natural fertilizers, including forest leaves and cow dung. Indeed being the world's tenth largest livestock producer, Ethiopia should not suffer underproduction because of lack of fertilizer. Appropriate technology that can tap, harness and enhance knowledge and potential for organic farming and the use of green manure will drive this country to the path of sustainable agriculture. Biological decomposition of cow dung can provide

cheap manure. But cow dung collection has been hampered by extensive grazing system currently practised among pastoralist communities in Ethiopia (FOA, 2006). More cow dung collection through intensive grazing would increase availability of both biomass energy and manure to the farmers. Moreover, green technology for recycling human wastes (excreta) for use as fertilizer can be explored and efforts that already exist in that direction be given more support. Some countries like China are already using composted human faeces as fertilizer with remarkable success (Shiming, 2002). According to Wolgast (1993) composted human faeces can increase annual grain consumption per person by 250kg. With a population of ninety million, human excreta is unexploited source of fertilizer for Ethiopia. Nevertheless, the challenge remains on harnessing knowledge and technology for tapping that potential. Additional challenge will be how to transport the excreta from urban centres to rural areas where it is needed for agricultural use.

However, as noted by Wallace and Knausenberger (1997), increased dependence on organic fertilizer can put more pressure on forests leading to degradation of environment and reducing the gains in agricultural productivity. Therefore, on the other hand Ethiopia must increase production and distribution of inorganic fertilizer. This goal can be achieved through increased involvement of the private sector in manufacturing and distribution. Inorganic fertilizer would work well when accompanied with appropriate technologies for organic management and farmer's knowledge of market best practices.

Finally, Ethiopia occasionally experiences long droughts. This is usually accompanied by pests and diseases which destroy the crops thereby reducing the country's productivity and quality of produce and increasing vulnerability to food insecurity. As sustained by World Bank (2008) appropriate technologies that bring to the market crop varieties that are resilient to drought, pests and diseases should be encouraged. High yielding varieties and certified seeds can improve productivity and requires investment on research and development. Moreover, index based insurance of crops against drought can ameliorate smallholders from losses. But bearing in mind that Ethiopia relies on rain fed agriculture, irrigation is necessary to reverse the trend. Drip irrigation introduced by Chemonics international to Afghan smallholders was noted for being efficient in water use and in improving productivity (USAID, 2011).

With regard to livestock farming, herders should be trained on best practices. For example most of them depend on extensive grazing despite environmental concerns and its unsustainability. Training to help them to adopt modern herding techniques and change their attitudes to view herding as an entrepreneurial activity may be necessary. Technical cooperation on knowledge sharing with government employees, especially extension officers can enhance their capacity to provide high quality inputs and agricultural services including vaccines, medicines, agro chemicals and advice.

However sustainable agriculture can only be realised through effective public-private partnership. The private sector will play critical role in leading development in new and appropriate technologies such as agro-processing and manufacturing and distribution of fertiliser. On the other hand, public sector accelerates its development by enacting policies that create favourable environment for agriculture (USAID, 2011). Public Private Partnerships (PPPs) modelled in the form of agricultural growth corridors and being implemented by Agdevco is successfully transforming smallholders in Zambia and Tanzania to market oriented entrepreneurial farmers. This integrated and innovative perspective of agriculture takes the entire value chain approach; linking infrastructure to agriculture potential areas, promoting efficient logistics through inputs, storage and transportation to the market and providing finance and credit to smallholders. Its cluster activities promotes dissemination of knowledge and best practices, increases efficiency and spurs competition among input suppliers, thereby reducing input price. By linking smallholders in one region, this practice makes it possible to carry out large scale irrigation by smallholders, enhances warehouse management and improves output storage (Agdevco website). Having noted that these are similar to the challenges bedevilling Ethiopia's agriculture, Ethiopia has important lessons to draw from the agricultural growth corridor.

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