


Financial needs and tools for agricultural development and transformation pertinent to low-income, food-insecure countries

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Abstract

The process of agricultural transformation is discussed, and the role of agriculture in both growth and poverty reduction is reviewed. The finance needs for agricultural development in low income food insecure countries is discussed, and the public and other official flows to agricultural development reviewed. It is seen that the monetary flows into agriculture have been grossly inadequate, compared to needs. The situation of smallholders is reviewed, and their financing needs are explored. It is indicated that the current finance flows to smallholders are less than 5 percent of perceived needs. A variety of institutional methods and models for increasing agricultural smallholder finance are then reviewed and assessed.

1. Introduction

The purpose of this paper is to explore the finance needs that arise in the course of agricultural transformation in low income food insecure countries, and then to review financial tools that have been utilized in a variety of settings in the agricultural sectors of such countries. The effort will be to identify situations and settings where some types of financial institutions are more likely to be successful than others.

The agricultural transformation seems to be an inevitable stylized fact of development, characterized largely by major changes in agricultural land and especially labor productivity. It is the transition to a state of higher agricultural productivity, and the ensuing higher level of aggregate income, that creates the needs for finance, and the appropriate provision in both amounts as well as form of finance can facilitate or delay the necessary transformation.

Rural smallholders are the predominant agents of agricultural production in most low-income countries, and are also the agents where the largest incidence of poverty and food insecurity is located. Rural smallholders have needs for similar types of financial services as urban-based agents, albeit the types of specific financial products needed are different given the agricultural product cycle. These include savings, loans, insurance, production and consumption risk management tools, payment systems, et cetera. Many rural residents and agricultural producers are constrained in their economic behavior by the absence of many of these tools, and are consequently greatly hampered in improving their livelihoods, thus affecting overall growth and welfare of the countries where they reside.

There exists a multitude of formal organizations that deliver financial services to rural residents, including commercial and publicly owned banks and insurance companies, savings and loan cooperatives, microfinance banks, specialty financial institutions, such as leasing companies, housing and consumer finance companies. However, many of these institutions have not expanded much into agricultural finance. This because of the dispersion of agricultural households that renders the provision of services expensive, the covariate risks, usually linked to weather, that affect large numbers of rural households simultaneously, lack of knowledge about the particulars of agriculture, and low education on the part of the rural service recipients. In their absence, a variety of informal financial institutions have tried to fill the gap. These include rotating savings and credit associations, local credit unions, financial NGOs, businesses financing their agricultural customers, local private moneylenders, friends and relatives, self-help groups, and many others. Nevertheless, a large number of rural smallholders in many low-income countries are underprovided in financial services, and face high costs for the financial services available.

The paper will commence by discussing the patterns of agricultural transformation and its relation to overall growth and food security in different parts of the world. In the next section the way in which agriculture grows is reviewed. Section 4 describes the financial flows and financing gaps to agriculture. Subsequently the paper discusses various models of rural finance, as well as the wide

perceived gap between needs and possible remedies in rural finance. Recent innovations in rural finance are explored. Finally, the paper indicates in the concluding section lessons from the reviewed literature.

2. Agricultural transformation, food insecurity, and development

According to Timmer (2008), “a powerful historical pathway of structural transformation is experienced by all successful developing countries. This structural transformation involves four main features: a falling share of agriculture in economic output and employment, a rising share of urban economic activity in industry and modern services, migration of rural workers to urban settings, and a demographic transition in birth and death rates that always leads to a spurt in population growth before a new equilibrium is reached”. Political pressures generated along the pathway, because of the distributional implications of the transition have led to diverse policy approaches designed to keep the poor from falling off the pathway altogether.

Among developing countries in all continents the share of agriculture in GDP has declined considerably over the last 40 years, with the fastest declines having been in East Asia and Pacific, and South Asia. By contrast the rates of decline have been much smaller in Middle East and North Africa, as well as Sub-Saharan Africa (CTA, 2013).

According to the World Bank’s World Development Report 2008, which was devoted to Agriculture (World Bank, 2008, figure 1.2, p. 28), the average shares of agriculture in GDP and share of labor in agriculture, as functions of GDP per capita both decline as a function of GDP per capita, with the labor share being largely above that of the GDP share, and both asymptotically converging towards each other and towards zero at the higher income levels. In other words it appears that in the long run the share of agriculture in GDP and the share of labor in GDP tend to reach the same level. Theoretically this is possible only when the level of GDP per agricultural worker or the level of average product per agricultural worker is the same as the level of non-agricultural GDP or average product per non-agricultural worker. This equality largely defines the end of the agricultural transformation, and implies that agriculture can be regarded in the same fashion from an income and distribution perspective as anyone of the many sectors of the economy. Several of the advanced economies have largely reached this stage.

While the structural transformation just discussed seems an inevitable part of growth, the role of agriculture in development and growth is much more controversial. For many of the world’s poorest countries, especially in Africa, a future without or low levels of agriculture has been urged as the efficient path to development (e.g. Rosenzweig, 2004, Wood 2003). Many macro economists, convinced of the power of rapid economic growth to lift populations out of poverty, see resources devoted to slow-growing agriculture as wasted. A “pessimistic school” of agricultural development specialists thinks that for both technical and economic reasons, Africa cannot rely on agriculture as a source of growth or poverty reduction (Maxwell, 2004). In fact the question arises that in a world

of ample food supplies in world markets (some of it free as food aid) and increasingly open borders for trade, what is the role of agriculture in pro-poor growth.

Development thinking and practice in the 1960s and 1970s tended to neglect agriculture as a leading sector, with its emphasis on import substitution industrialization and export promotion. It was only in the late 1970s and early 1980s that the role of agriculture as a leading sector was re-emphasized in the development literature by authors such as Mellor (1976) and Adelman (1984). These authors emphasized the importance of agricultural growth in generating demand for locally produced non-tradable products, and thereby stimulating overall production and growth. Such a strategy was termed Agriculture Demand Led Industrialization (ADLI) by Adelman (1984).

The real issue from a growth perspective is how to accelerate growth. Recently, in relation to the revival of discussion about growth rates, in the context of the “endogenous growth literature”, there has been a number of papers dealing with agricultural growth, the terms of trade, and overall economic growth (Skott and Larudee (1998), Sarris (2002), Gollin Perente and Rogerson (2002)), Adamopoulos and Restuccia (2014)). Almost all of these models and papers highlight the fact that a healthy agricultural sector should be the driving force behind industrial growth in the early stages of development, superseded by export growth in the later stages. They also point out that the degree of openness, especially in the presence of economies of scale, is a key factor in understanding the role of agricultural productivity growth in speeding up overall growth. They indicate that since that demand factors are crucial in determining whether agricultural productivity growth is helpful for overall growth, the distribution of income and gains from growth is a key factor in this issue. They finally point out that the composition of demand among tradables and non-tradables is an important element of the agriculture-first theories. The models, however, do not consider the issue of how agricultural productivity growth is to be achieved and how it is to be financed.

The World Bank (WB) World Development Report (WDR) on agriculture (World Bank, 2008) classified countries in three groups in terms of agriculture’s role in fostering growth and poverty reduction. First are the agriculture-based economies (most of them in Sub-Saharan Africa), where agriculture contributes significantly to growth, and the poor and food insecure are concentrated in rural areas. The key policy challenge in such economies is to help agriculture play its role as an engine of growth and poverty reduction. The second group consists of transforming economies (mostly in Asia and North Africa and the Middle East), where agriculture contributes less to growth, but poverty and food insecurity remain overwhelmingly rural. In such countries growth in agriculture and the rural nonfarm economy is needed to reduce rural poverty and narrow the urban-rural divide. The final group consists of urbanized economies (mostly in Eastern Europe and Latin America), where agriculture contributes only a little to growth. In these economies, agriculture can reduce the remaining rural poverty by including the rural poor as direct producers and by creating good jobs for them.

According to the World Bank, poverty is concentrated in rural areas, where 75 percent of the

world's poor live. The decline in the \$1-a-day poverty rate in developing countries— from 28 percent in 1993 to 22 percent in 2002—was mainly the result of falling rural poverty (from 37 percent to 29 percent) while the urban poverty rate remained nearly constant (at 13 percent). More than 80 percent of the decline in rural poverty was attributable to better conditions in rural areas rather than to out-migration of the poor. So, contrary to common perceptions, migration to cities has not been the main instrument for rural (and world) poverty reduction.

Similarly the most recent State of Food Insecurity report (FAO, IFAD, WFP, 2015) indicates that there is a negative relation between agricultural productivity and undernutrition.

But the large decline in the number of rural poor (from 1,036 million in 1993 to 883 million in 2003) as well as food insecure (from 1011 million in 1990-92 to 795 million in 2014-16) has been confined to East Asia and the Pacific. In South Asia and Sub-Saharan Africa the number of rural poor and food insecure has continued to rise and will likely exceed the number of urban poor until 2040. In these regions, a high priority is to mobilize agriculture for poverty reduction.

3. How does agriculture grow?

What is the process through which agriculture grows? Concerning agricultural growth and its components, early research (Binswanger et. al. 1987) showed that the major determinants of agricultural supply are physical capital, infrastructure, human capital, research, extension, and rural population density. Prices were found to be weak determinants of agricultural supply. Similarly Antle (1983) showed that the major determinants of total factor productivity (TFP) in agriculture in cross-country regressions are education, research and infrastructure. Later research (Mundlak, Larson and Butzer, 1997), confirmed these results and specified that technological change in agriculture is incorporated into increased agricultural production through the increases in physical capital stock.

The changes in the total factor inputs appear to account for only about half of the total growth of agricultural output. The rest is accounted for by the “residual”, namely what is normally termed total factor productivity, which is basically technical change. Mundlak (1999) suggests that the empirical evidence points to the fact that the major way technology is incorporated into agricultural production is through physical capital. The different rates of growth of physical capital among sectors in turn can lead to differential sectoral growth rates along standard Rybczynski theorem logic. Changes in technology, however, especially those involving new discoveries in production techniques, come irregularly, and hence cannot be planned.

Studies that explore the contribution of different factors to agricultural TFP growth. have shown that publicly funded agricultural research and extension are the two most important factors accounting for TFP growth, with rural education, irrigation, rural roads, rural electrification coming next. The internal rates of return to public agricultural research in particular are estimated to be higher than 50 percent (Evenson, Pray and Rosengrant, 1999, Fan, Hazell, and Thorat 1999, Fan, Zhang, and Zhang 2000)

The latest work on agricultural growth and productivity is that of Fuglie et. al. al. (2012). Their major finding is that despite earlier worries to the contrary, based on analyses of TFP growth in agriculture during 1970-1990, there does not appear to be a slowdown in sector-wide global agricultural productivity growth. If anything, the growth rate in global agricultural TFP accelerated since 2001, in no small part because of rapid productivity gains achieved by developing countries, led by Brazil and China, and more recently because of a recovery of agricultural growth in the countries of the former Soviet Union.

It thus appears that publicly financed research and extension, and rural infrastructure in the form of rural roads, electricity, irrigation, et cetera, are the major contributors to agricultural TFP growth, with investments in human capital also a significant factor (Alston, et. al. 2000). Evenson and Westphal (1995) point out that there are significant differences between agriculture-related research and industrial research, with the former much more circumstantially sensitive, namely sensitive to local conditions. Thus, to make agricultural research have a high payoff, the large fixed cost of establishing and running technological facilities must be geared to producing results that can possibly be adopted by a large number of producers. This explains, for instance why returns to agricultural R&D have been so high in densely populated agrarian countries such as those in Asia, while they are lower in sparsely populated agrarian economies, such as those of Africa.

Given that the largest incidence of food insecurity is among rural smallholders, it is also imperative that agricultural investments also take account of the constraints that limit the growth of smallholder agriculture. These are the limitations in access to productive assets, unfavorable market conditions such as price volatility and lack of physical and financial access to markets, and lack of collective bargaining (HLPE, 2013).

4. Financial flows into agricultural development

There are two major types of finance for agricultural production and growth. First is medium and long-term finance for investment in both private capital as well as public capital. Second there is short-term finance for production or marketing. In this section we concentrate on finance for capital accumulation.

A recent State of Food and Agriculture report by the Food and Agriculture Organization (FAO, 2012, figure 7, p. 17) indicates that capital stock is directly related to agricultural GDP. The same report (Table 1, p. 17) indicates the enormous difference in agricultural capital stock per worker among developed and low and middle-income countries. The ratio in 2005-07 was almost 35:1. More worryingly the growth rate of agricultural capital stock per worker in developing countries has declined over the past 30 years, compared to a significant increase for developed countries. The decline is large and significant in Sub-Saharan Africa and insignificant in South Asia, while in all other regions the agricultural capital stock per worker has increased.

FAO (2012) suggests that the level of per worker agricultural capital stock is directly related to the level of agricultural public expenditure per worker. This makes for a direct link between agricultural

public expenditures and agricultural capital stock. However, not all public expenditure in agriculture is investment. The share of investment in agricultural public expenditures varies from 9 to 84 percent as per a review of relevant figures by FAO (2012).

Concerning public expenditures for agriculture, FAO (2012) reports that while total public expenditures have increased world-wide in absolute terms, but mostly in the East Asia and Pacific and Latin America regions, the share of public expenditures going to agriculture has declined over time. Moreover, within that declining share, the share of agricultural GDP going to research and development, a major determinant of agricultural productivity growth, has stayed the same in low- and middle-income countries at 0.54 percent, while the share in high income countries has increased from 1.53 percent in 1980 to 2.37 percent in 2000 (FAO, 2012, p. table 7, p. 31). The food crisis of 2006-8 may have changed these trends but no aggregate figures are available.

The financing needs of agriculture to achieve a world free of hunger by 2025 have been estimated by Schmidhuber and Bruinsma (2011) who provide estimates of incremental public expenditures on agriculture and safety nets needed. Over this period, incremental annual public expenditures is US\$50.2 billion. Of these the bulk (18.5 billion US\$ or almost 40 percent) is for expansion of rural infrastructure and market access, 9.4 billion is for conservation of natural resources, 6.3 billion is for research and development and extension, 5.6 billion for rural institutions and 10.4 billion for safety nets. They also estimate the average total (public and private) annual investments (not only incremental) needs of agriculture in low- and middle-income countries for the period up to 2050 to reach the FAO long term projections for food and agriculture that are consistent with global food adequacy. The investment needs are considerable amounting to more than 200 billion constant 2009 USD annually.

Concerning resource flows into agriculture, Lowder and Carisma (2011) have made a review of all the available information sources on this and have arrived at some general findings. Comparing among datasets, the average spending on and investment in agriculture for low and middle income countries for the three most recent years for which data is available reveals that:

- Government annual spending on agriculture (both current and investment) in low and middle income countries averaged 160 billion USD dollars in 2005 – 2007.
- Foreign Direct Investment (FDI) inflows to the above countries averaged 3 billion current dollars (2006 – 2008) to agriculture, forestry, fisheries and hunting.
- Official Development Assistance (ODA) to agriculture averaged 7 billion constant 2005 dollars during 2007 – 2009.
- All flows exhibited an increase in total levels as well as levels per agricultural worker, since at least the early 2000s.
- Levels of FDI were larger for the high income country group than for the low and middle income country groups.

The above numbers suggest that annual investment flows into agriculture are much smaller than what is needed to achieve a world free of hunger. Among these flows, ODA to agriculture decreased from the 1980s to 2004 and from then on has increased considerably. Furthermore, the composition of aid to agriculture from 2000 to 2008 reveals that the bulk of aid to agriculture (more than a quarter) has gone into agricultural policy and administration management. Food production and extension, while small in the early 2000s, have seen a revival in the later years.

Concerning FDI flows into agriculture, Lowder and Carisma (2011) have reviewed available figures on this and showed that much of the apparent upward trend in total FDI is in reality due to an increase in the number of countries receiving FDI that are included in the dataset (from about 30 to 70), and because the data are reported in current dollar values, rather than constant dollar values. They also showed that FDI inflows to food and beverages are much larger than inflows of FDI to agriculture.

5. Rural finance and agricultural development

Agricultural transformation in the current era involves a world of rapidly changing agrifood systems. In particular the changing nature of retail systems, with the rise of supermarkets, and the global food chains that supply them has created many opportunities as well as potential problems for the world's smallholders as well as many finance related issues (for useful references see Reardon et. al. 2003, Swinnen and Maertens, 2007, Mc.Cullough et. al. 2008). Some of the related finance issues are discussed in this section

The literature that deals with agricultural finance and development (for recent surveys see Conning and Udry, 2007, and Karlan and Morduch, 2010) has highlighted several issues pertinent to finance in the context of agricultural transformation and development.

- Financial market imperfections that limit access to finance is key to agricultural and overall development
- Access to finance is not easy to measure. Financial access by agricultural households is limited in Low Income Countries (LICs), and Emerging Market Economies and barriers to access are common
- Different financial services are required by different groups of farmers. Risk management and mitigation are of paramount importance for poorest.
- Insurance cannot be separated from credit
- Access to finance is both pro-growth and pro-poor. Spillover effects of financial development are likely to be significant
- Provision of financial services to the poor will require subsidies
- For the rural smallholders (about 450 million worldwide), credit is not the only service needed, but also savings and payment systems

- Multinational buyers increasingly rely on smallholders for procurement of supplies. Chief obstacle is large and largely unmet need for formal value chain finance.

The size of the unmet demand for rural smallholder finance is huge. A report by Dalberg (2012) estimates the demand for smallholder finance in the foreseeable future to be of the order of 450 billion US\$ per annum, of which only about 2 percent is currently met by “social lenders” defined as impact investors, who seek a combination of market returns and social impact. Impact investors generally accept lower-than-market rates of return in exchange for achieving social or environmental goals not easily quantified by the market. Microfinance institutions are, for instance, a form of social lending,

The above estimate is based on the rather dubious assumption that of the 450 million smallholders 225 million are subsistence farmers who do not currently need finance, while the other more “commercial” smallholders need on average 1000 US\$ short term finance per annum and 1000 US\$ longer term finance amortized over several years. However, even small holders have financing needs, and clearly if one adds the financing needs of smallholders, which are not zero, the numbers are considerably larger.

Social lenders have established a successful model for providing short-term export trade financing to producer organizations and agricultural businesses that reach smallholder farmers. This is where the bulk of financing for agricultural smallholders goes. However, given that only 10 percent of smallholders belong to producer organizations, social lenders could currently address only \$22 billion of the short-term total financing demand or only 5 percent of total demand. Of that, 90 percent is for export trade finance, and this overlooks the huge demand for finance of staples, that comprises more than 90 percent of total demand for finance.

The Dalberg report proposes five distinct strategies, or “growth pathways,” for deploying investment that meets smallholder finance demand: (i) replicating and scaling existing social lending financing models, (ii) innovating into new financial products beyond short-term export trade finance, (iii) financing through out-grower schemes, (iv) financing through alternate points of aggregation, and (v) financing directly to farmers. These pathways map to particular value chain typologies, geographic focus, and cost structures. In particular, the efficiency of capital varies for each market pathway, because each involves a particular mix of the following costs:

- R & D costs, for developing and piloting models
- Marketing costs, for acquiring and educating customers
- Operating costs, for handling and servicing customers
- Risk management costs, accounting for volatility and the cost of capital

Each of the five growth pathways is discussed briefly below.

Growth pathway 1. Replicate and scale social lending

Social lenders can continue to expand their existing model of creating and supporting producer organizations and providing short-term trade finance to them. Social lending is targeted toward exportable cash-crop value chains characterized by high levels of smallholder aggregation into producer organizations. This growth pathway is driven by the marketing cost of increasing financial literacy and creating and acquiring producer organizations as clients. Risk management and operating costs are also relevant, but because this model is well established, the cost of R&D is negligible.

Growth pathway 2: Innovate into new financial products beyond short-term export trade finance

Building on the social lending model, this pathway involves social lenders, smallholders in producer organizations, and exportable cash-crop value chains. Currently, social lenders primarily provide short-term trade financing for producer organizations. Through product innovation, social lenders could expand to meet other financing needs, such as working capital, longer-term financing of equipment and tree renovation, and on-lending schemes for financing individual organization members. Some social lenders have already begun to experiment with these products.

This growth pathway is driven by high risk-management costs that stem from long-term lending exposure to market fluctuations. It also involves high R&D costs for developing and testing new products. Because new financial products would be marketed to existing clients, the cost of acquiring customers is small, but there is some cost associated with introducing a new product to customers.

Growth pathway 3. Finance outgrower schemes of multinational buyers in captive value chains

Many multinational buyers have captive value chains organized around out-grower schemes that involve production contracts with farmers. These captive value chains can be contrasted with social lender value chains, in which producer groups are not necessarily contractually bound to a particular buyer beyond each individual transaction. Commercial lenders (and social lenders to a lesser extent) could provide finance to smallholders through these out-grower schemes, focusing on markets where buyers already provide finance or technical assistance to smallholders.

This growth pathway is driven by the R&D cost of developing and testing new out-grower schemes. By using existing buyer relationships with farmers, marketing and operating costs can be kept relatively low. Lenders can reduce risk-management costs by sharing risk with buyers and, possibly, farmers.

Growth pathway 4: Finance alternative points of aggregation

Aggregating farmers allows easier penetration of finance supply, but less than 10 percent of

smallholder farmers are aggregated in producer or other organizations, especially in domestic value chains for local staples. Financing for these smallholders could be channeled through alternate points of aggregation in the value chain, such as warehouses, procurement networks, and input providers.

This growth pathway is one of the most expensive on a per-farmer basis, because it involves the high R&D cost of new finance models and the high risk management cost of financing small businesses. It also involves moderate marketing and operating costs related to working with small business clients. Therefore, this is an ideal pathway for donors to support if the social or environmental impacts warrant their attention.

Growth pathway 5: Finance direct to farmer

The value chains of some local staples are unorganized, with dispersed producers and few points of aggregation. Reaching smallholders in these value chains is the last mile of addressing smallholder finance demand. The most promising solution is a variation on microfinance models for agriculture markets, perhaps through mobile banking.

This growth pathway is also expensive on a per-farmer basis, because non-aggregated farmers tend to be isolated and dispersed across rural areas. In rural settings, the R&D costs of developing distribution models are high, as are the costs of marketing and operating. However, this growth pathway has the potential to minimize risk through diversification across a wide client base. Microfinance institutions could play a key role in addressing this demand.

There are different actors that are involved in each of the five pathways. The primary financier for the first two pathways are social lenders, while the primary financier in the third growth pathway is commercial lenders, the primary financier in the fourth pathway is donors and impact investors, and for the fifth pathway it is microfinance institutions. Needless to say that several of these financiers can be involved in the other pathways as well. There is ample room for all types of financial lenders to enter different parts of the rural finance market.

The above, finance models must be combined with existing finance mechanisms, many of which also serve the “subsistence sector” and this is why they must also be considered. These models are the following:

- Family and friends network “informal” finance
- Interlinked credit (credit with labor, or credit with land sharecropping, et cetera.), practiced between a larger intermediary (normally landowner or trader) and a farmer
- Microfinance through group lending
- Input supplier finance (interlinked trade and short term credit)
- Trader finance (interlinked trade and short term credit)
- Cooperative finance

- Government finance via monopolistic purchasing and input supply parastatals

Clearly there is partial overlap between these and the earlier pathway models, but all are needed if the huge unmet needs for rural finance are to be met.

In this context it is also useful to discuss recent innovations in rural finance. The main ones among these are discussed in the sequel:

Finance through forward sales and contract farming seem to be simple and compatible with many of the institutional structures of the developing agrarian countries. They normally involve an agreement between a seller and a buyer. They are widespread in many parts of the world especially between larger scale intermediaries such as processors who need raw materials, and groups of farmers. Many times the processors provide credit in the form of either cash, or advance provision of inputs for production. Such contracts are a way to reduce price risks to farmers, but they seem to be more prevalent in products that need processing or are perishable. There are many different types of contracts (Bijman, 2008).

Contract farming and forward sales are well suited to the social network based institutional setting of African as well as Asian farmers. They are based on trust and hence enforcement may sometimes be difficult. They are also much less appropriate for sales of staples, as the quantities to be delivered are not easy to guarantee, given the changing seasonal food security objectives of farmers. (For useful recent surveys of contract farming see Wang et. al. 2014, and Prowse, 2012) .

As liquidity and credit constraints are major aspects of food insecurity and are present in many developing countries, a system that offers considerable promise is the **Warehouse Receipt System** (WRS). The idea of such a system is that a producer of a storable commodity can deposit in a particular location an amount of the commodity of stated quality against a receipt. The commodity could be cleaned, dried, graded, and stored, all for a fee. The depositor could sell the commodity any time in the future, and with smaller transaction cost, as the sale could be done with paper or electronically. The main advantage of such a system in credit constrained rural settings is that the warehouse receipt could serve as collateral for loans obtained by a bank. This could alleviate one of the major constraints of small farmers, namely the need for cash at harvest time, and allow them to market the product at a later time when prices are presumably higher.

A limitation of this system is that a warehouse may require a minimum lot size to issue a receipt, and this may in effect be an entry barrier for smallholders. However, while a WRS may not cater to smallholders, it may well cater to larger operators who may act on behalf of smallholders. These could be cooperatives, larger traders, and others. For a useful survey of the WRS see Hollinger, et. al. 2009)

Another closely related institutional arrangement is an **inventory based credit system**. The idea of such a system is that groups of farmers place their product in a warehouse and a lending institution, such as a Microfinance Institution (MFI) or a bank, uses the inventory as collateral to

extend individual loans to farmers. The management of the inventory is the collective responsibility of the group, and this places demands on the system in terms of trust. The difference from the WRS is the less formal nature of the system, and the focus on groups. This system has been tried in Ghana and Zambia among others (Coulter and Onumah, 2002).

Another related mechanism would be to **indemnify loans for price risk**, in the sense that the price risk could be made part of a loan package. In some African settings price risk may be a major reason for possible non-repayment of a crop or other agricultural product loan, thus rendering lending from banks very risky. In such cases a minimum price, put option like contract could be made part of the loan, so that if the price fell below a certain level, the farmer would not have to pay back the loan. The implicit cost of the option could be included in the overall loan, so that the farmer may not have to put up any money up front, but would have to pay back a larger amount later, at the time of repayment.

Another approach to rural finance is **cereal banks**. The idea here is much like the warehouse receipt system and the inventory based credit system discussed above, except that it applies mostly to staple crops, such as cereals. Given that cash and export crops are easier to finance than cereals, the cereal bank idea is promising for the largest component of unmet demand for smallholder finance, discussed above.

6. Conclusions

The main conclusions that we can draw from the above survey and discussion are the following:

- i) Declines in food insecurity and poverty are associated with increased agricultural productivity, which is key part of economic transformation in the context of growth
- ii) Agricultural transformation entails considerable financial needs. This is because the demands for productivity improvements necessary in the course of the transformation require considerable capital upgrading, and also short term financing for production inputs, the demand for which increases with technical change.
- iii) Lack of finance can choke off agricultural development and poverty reduction. This is because of the reasons indicated under (ii) above
- (iv) Government expenditures and financial flows into agriculture are inadequate in most developing countries
- (v) The investment financing needs for agricultural transformation in low income countries are very large, and current lending accounts for a very small share of total needs.
- (vi) The bulk of financing flows into agriculture is private, with public flows very small compared to the total

(vii) Donor ODA flows into agriculture are small compared to needs, and have fluctuated considerably over the past two decades

(viii) Most agricultural transformation and poverty reduction should be based on a smallholder model of development

(ix) Large gaps exist in smallholder financing needs compared to existing flows

(x) Traditional rural financial institutions are inadequate to meet needs

(xi) There are several promising rural financial innovations that are emerging, and which could address the serious finance gap for agricultural development

In summary the lack of adequate amounts of agricultural capital and short-term finance can slow down the agricultural transformation and consequently the growth rates and declines of poverty and food insecurity in low income countries, but new institutional structures could alleviate the problem considerably.

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