

Food Security and a Holistic Finance for Rural Markets

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Investments in agriculture, particularly in smallholder agriculture in developing countries, are regarded as critical for meeting the food demands of a growing world population.³ Improvements in agricultural finance, mainly in providing investment credit to farmers, are widely regarded as an important approach to stimulate production.⁴ While this is certainly true, it is only part of the story. Agriculture-related physical and market infrastructure have been widely neglected in the discussion despite their immense relevance for making food available in developing countries – and as a precondition for farmers to produce at all.

In this chapter, we describe the investment and financing needs of every step in the food production and distribution chain: from farm to fork, from pasture to plate, or from barnyard to belly. Take your pick.

1 Commercialisation of Farming as an Opportunity

The global economic framework for agricultural production has changed significantly in recent years. Most importantly, after decades of stagnating commodity prices, prices for agricultural produce, processed as well as non-processed, have significantly increased and are expected to increase further. Population growth and increased demand for high-value food products – particularly in the big emerging markets – are the underlying factors that indicate a continuing challenge.⁵ This

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³ The term “food security” is used loosely in this article. We do not refer to all dimensions of the 1996 World Food Summit’s comprehensive definition of food security as “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”.

⁴ See for instance Doran, et al. (2009).

⁵ See for instance Chao-Bérouff (2013).

higher price level for agricultural goods that is likely to continue implies the opportunity for higher income for farmers in particular in developing economies since it promises higher economic returns for agricultural production.⁶ Thus, investment in agriculture and modernization of production are rewarded. Indeed, they are more attractive today than they have been for many years.⁷ At the same time, investments in agro-processing and related trade activities may become economically more attractive, which should boost investments.

However, these investment potentials in agriculture face two major bottlenecks: a lack of adequate infrastructure that connects agricultural production with markets, and a lack of finance for these investments. The lack of finance is not only a bottleneck for private investments in primary agricultural and processing, but also for the connecting infrastructure, both private and public.

We will explore these hurdles for agricultural production to reach consumer markets and to gain its full potential, and we will highlight the respective roles of the financial sector.

2 The Cross-Cutting Relevance of Transport Infrastructure

The relevance of physical infrastructure in rural areas, and how it can be financed, is an inexhaustible topic. Nevertheless, it has been neglected in the discussion around food security. Particularly, the relevance of (rural) transport systems for effective food production and efficient marketing to consumers has been tremendously underrated in the discussions. Discussing the development of agricultural production and of rural areas needs to re-address rural transport infrastructure – today more than ever in view of the changed global system of food production. Thus, the relevance of rural transport will re-appear in all sections of this chapter.⁸

⁶ “Small-scale farmers will not invest in boosting production beyond their personal needs unless there is something in it for them”, Gouillou and Matheron (2011), p. 68.

⁷ Although the authors believe that these incentives are generally positive and necessary to increase agricultural output to feed the world’s population, on the flip-side of the expected higher returns of agricultural production there are obviously negative effects, too. Apart from potential ecological problems resulting from intensified production, the large-scale acquisition of fertile land by commercial investors may be the most prominent one. There are several reports, that such large-scale acquisitions have lead to the expulsion of small-scale farmers, and government and development financiers need to respond to such developments. This discussion shall not be deepened here. As a starting point for reading, we suggest Oxfam International (2011) and Deininger and Byerlee (2011). See also <http://landportal.info/landmatrix>, a project to maintain a public online database on large-scale land deals.

⁸ Rural transport system does not consist of roads. The existence of transport services and the different modes of transport (including non-motorized transport) have to be taken into account. See Sieber (2011) for an introduction into the role of rural logistic chains for the integration of smallholders into emerging agricultural markets.

2.1 Food Which Is Never Produced

Many farmers in developing countries farm for subsistence. But many more farmers are profit-oriented entrepreneurs who sell their products to markets, and there is potential for subsistence farmers to become commercial farmers. These commercial farmers will only engage in production if they expect adequate earnings from their economic activities. Price levels are typically uncertain for most agricultural goods; they cannot be controlled by the individual farmer, and this uncertainty influences the farmers' production decisions what to grow or rise. Equally, the level of production output cannot be fully controlled by the farmer because of external agricultural risks such as weather and pests, although the farmer can apply strategies to mitigate these risks to a certain extent. The farmers' micro-level decision-making process under such uncertainty remains sketchy and is difficult to analyse on a generic level.

However, what is more clearly assessable for a farmer and is certainly reflected in farmers' decisions is the cost of transport of produce from the field to the next market.⁹ Transport costs are typically not that fluctuating, although changes in prices for petrol (in case of motorised transport) and sudden deterioration of road conditions (e.g. through rainfalls or earth-slides) influence transport costs. Taking the price level at the market and the farmer's production costs as given, the transport costs remain the determining (and alterable) factor for the farmers' income.¹⁰

⁹ This is certainly not a new insight. In the mid 19th century, Johann Heinrich von Thünen, one of the first dedicated agricultural economists in the history of economic theory, explained the type of crops chosen by farmers as a function of distance to urban markets. See von Thünen (1910). Sieber (1999) finds that the circular structures of agricultural land use around towns – with the intensity of agricultural production decreasing with further distance to the market – that have been observed by von Thünen in pre-industrialized Germany can be identified regularly in today's cropping patterns in Sub-Saharan African countries.

¹⁰ Different studies have shown that farmers usually do not have bargaining power to shift the transport costs to other parties: The price at the urban buyer markets is typically a fixed reference with the transport costs to these markets being levied onto the farmers lowering the price at farm gate. See for instance Mkenda and Van Campenhout (2011) in their study about Tanzania, p. 9. The share of transport costs in the price at urban markets is often significant. Mkenda and Van Campenhout (2011), p. 16, report the traders' transport costs from a village to a nearby town (25 to 75 km distance) as around 10% of the farm-gate price (without the traders' margin). A study in the Atlantic zone of Costa Rica reports that the farm-gate prices amounts to approx 40% (papaya), between 50% and 55% (banana, cassava and young maize) and 70% to 78% (Cocoyam) of the respective selling prices at the urban farmer market, with the difference being presumably made up from transport costs and margins of traders and transport companies involved. See Hoekstra (1996).

Box 1: Some Examples for Evidence of the Positive Effect of Improved Road Connectivity on Agricultural Production

There is substantial evidence that investments in roads and road connectivity have a positive impact on agricultural productivity and output in developing countries.¹¹

Ex-post evaluations of KfW-financed transport projects have illustrated the contribution of roads to stimulate food production. The asphaltting of a road in Nepal's Dhading Besi district that connects 150,000 people to the national road system has resulted in an increase of vegetable production in the area from around 12,200 tons to almost 50,000 tons. The main, underlying reason is the reduction of price for cargo haulage by two thirds due to the road improvement.¹² A similar result is documented for a road investment in Chad where the construction and improvement of two main gravel roads that connect the regions Ouaddai and Wadi Firi to the national road network contributed to a tripling of the peanut production.¹³

An econometric study across 21 Sub-Saharan African countries has revealed that there is substantial scope for increasing agricultural production by investing in road infrastructure and thereby increasing accessibility of markets.¹⁴ Total crop production relative to potential production turned out to be approximately 45 percent for areas within four hours travel time from a city of 100,000, whereas in contrast total crop production relative to agronomic potential is only about five percent for areas more than eight hours travel time from a city of 100,000 people.

An econometric analysis on the effects of road connectivity in Madagascar on intensity of agricultural input use, crop outputs, and household income gives evidence that geographical remoteness negatively affects agricultural productivity and incomes at the household level.¹⁵ An econometric analysis in China also showed the positive impact on poverty reduction by public investment in roads.¹⁶ Another econometric modeling illustrates that in DR Congo the road access to cities and ports is highly relevant for seizing the country's huge agricultural potential.¹⁷

¹¹ The strengthening of rural road systems has positive impacts that go far beyond agriculture and plays a central role in overall poverty reduction. See Faiz (2012), pp. 15-23.

¹² See KfW (2005), p. 22.

¹³ See KfW (2005), p. 28. Before the investment, both named region where only connected via one earth road that was impassable during the rainy season.

¹⁴ See Dorosh, et al. (2009).

¹⁵ See Stifel and Minten (2008).

¹⁶ See Fan et al. (2002), p. 44: "Government expenditure on rural infrastructure also made large contributions to poverty reduction. These impacts were realized through growth in both agricultural and non-agricultural production. Among the three infrastructure variables considered, the impact of roads is particularly large. For every 10,000 yuan invested, 3.2 poor are lifted above the poverty line. Roads, thus, rank third in poverty-reduction impact, after education and R&D [research and development]"

¹⁷ See Ulimwengo et al. (2009).

With a better road infrastructure, inputs may also reach the farm more easily and stimulate production: seeds and fertilizer, agro-consulting, machinery maintenance services,¹⁸ seasonal workers and – financial services. The authors are not aware of any empirical study on to what extent road improvements have led to an increase of financial penetration in rural areas. But the relation is obvious. A decent road connection is vital for any bank branch to work properly (cash transport to and from central branch, monitoring of credit clients, etc.). With regard to the bank-customer interaction, particularly for credit extension, physical access is crucial. Bank staff needs to visit the clients' premises for analysis, and the credit client needs to return to bank branches or other facilities to pay regular installments. The travel cost of rural bank clients – both in cash and time – typically constitutes a significant portion of the cost of taking a credit from the borrower's perspective.

The expansion of mobile banking, i.e. the use of cell phones to connect to bank accounts or to store money on the cell phone provider's account and to endorse transactions, may provide a viable alternative for some of these services and may give some relief to the transport cost issue where there is no bank branch. However, this is likely to reduce mostly the cost of money transfers (between bank and customer, and between customers). In processes between bank and client that require closer interaction, like for instance credit analysis and credit monitoring, mobile banking is not likely to move the financial frontier for too far into the rural economy.¹⁹

2.2 Post-harvest Losses as a Critical Factor for Food Security

Typically, discussions about income generation for farmers as well as food security concentrate on (increasing) agricultural production and the necessary on-farm investments. This does not give the whole picture. Significant losses of produce are occurring after production: Post-harvest losses, usually understood as measurable quantitative and qualitative food loss in the post-harvest system,²⁰ are estimated and

¹⁸ Dorosh et al. (2009) in a study across 21 African countries suggest that the adoption of high-input agricultural production technology is negatively correlated with travel time to urban centres (although adoption rates are generally low throughout most countries of Sub-Saharan Africa).

¹⁹ Compare Westercamp (2013).

²⁰ See de Lucia and Assennato (1994). The "post-harvest system" contains cutting and on-field handling, threshing, drying, milling, storage and transport. Also food discarded in supermarkets (due to substandard appearance like blemishes or misshapen produce) or at home (being left on the plate or due to passed expiry dates) are often discussed as post-harvest loss. See Hodges et al. (2011). Losses at production, post-harvest and processing stages in the supply chain are often referred to as "food losses" whereas losses in retail and in connection to final consumption are often called "food waste", which conceptually relates to retailers' and consumers' behaviour (see Parfitt et al., 2010) and is often associated also with a moral appeal. When we use the term "food loss" or "post-harvest loss" in this article we roughly follow Parfitt et al. (2011) and use

recorded to be between 5% and 70% of original quantity in developing countries.²¹ Thus, food losses have a significant impact on food security, both in terms of available quantities, and in terms of (potential) effects on the price of food.

In Western economies a tremendous amount of food is wasted in supermarkets or in the consumers' households (in the USA 9% and 17%, respectively).²² This finding is not merely a technical issue, but is often associated with a moral appeal since the waste in supermarkets is partly due to the fact that consumers are reluctant to buy vegetables with marks or wrinkles, and losses in the fridge are partly due to uncontrolled or thoughtless buying patterns.

In developing countries, in contrast, losses in retail trade or in households are much lower. Here, the main part of loss is caused by biological spoilage in earlier steps of the production and distribution chain, for instance due to the (delayed or general) unavailability of adequate harvesting equipment, due to lack of adequate refrigeration in transport and storage, due to storage pests facilitated by unsafe storehouses, or to damages due to a lack of adequate packaging. See [Table 1](#) for the different technical reasons for quantitative and qualitative food losses. (Note that some forms of initially qualitative losses like rot may ultimately lead to quantitative losses.)²³

Strategies for reducing post-harvest losses are manifold, but the issue is not prominent on the political agenda.²⁴ The approaches to reduce post-harvest losses

it in reference to the agricultural post-harvest system and trade structures insofar as these losses are mainly due to a lack of (investment in) adequate technologies and its competent use. "Food waste" in households and retail stores we understand as destruction of food due to human consumption behaviour which is not dealt with in this article.

- ²¹ See Hodges et al. (2011), Kader (2005) and Gustavsson et al. (2011). Typically, post-harvest losses are higher in more easily perishable produce like fruits, tuber, vegetable, and fish, and less in grains. However, in many developing countries post-harvest losses in grains can amount up to 35%, like for instance maize in Eastern Africa. See Hodges et al. (2011), pp. 40-41, based on APHLIS statistics (www.aphlis.net). Compare also Gustavsson et al. (2011) who give loss data on different food categories by regions. The level of post-harvest losses is also influenced by the production quality, i.e. good seeds and healthy plant growth can make produce more resistant to deterioration. Typically, production quality is also comparatively low in developing countries.
- ²² See Hodges et al. (2011), pp. 40-41. Hodges et al. also quote other studies that report similar levels for other countries.
- ²³ Next to technical causes for food losses, often connected to inadequate equipment due to sub-optimum investment, there are also cases of policy-induced food losses: Regulatory quality standards (grading systems) may demand the dumping of food. Fruits and vegetables are also withdrawn from the market and destroyed in order to protect prices. See Guillou and Matheron (2011), pp. 47-48.
- ²⁴ The discussion of post-harvest losses appears to be more a discussion among technical experts (logistics and packaging experts, veterinarians and the like) rather than a discussion in the broader policy sphere. Only recently, there have been some publications directed towards the broader public, for instance Stuart (2009). The first and until now

range from purely technical solutions (investments and altered processes) to regulatory measures.²⁵ Most of the approaches to reduce post-harvest losses call for investments, notably in transport facilities, storage, and packaging. But there is also a need for investment in human resources.²⁶

Table 1. Examples for the technical factors of post-harvest losses on the different post-harvest levels. Source: based on Guillou and Matheron (2012)

Nature of Losses	Position in the Post-Harvest System	Examples
<i>Quantitative Losses</i>		
Accidental	Harvest, transport, handling	Dropped or torn bags, spillage
Due to handling with tools	Harvest, threshing, transport, storage processing	Breakage of grains
Damage caused by birds	Pre-harvest drying	In-field drying of standing crops
Damage caused by rodents	Drying, transport, storage	Rats, mice
Damage caused by insects	Drying, transport, storage	Larger corn borer
<i>Qualitative Losses</i>		
Physical conditions	Harvest drying, storage	Heat, cold, humidity
Traces of birds and rodents	Drying, storage	Excretions, feathers, hair
Traces of insects	Drying, storage	Excretions, larvae, nets
Damage caused by micro-organisms	Drying, transport, storage	Aflatoxin contamination, rot due to fungal decay
Respiration and transpiration	Storage, transport	Perishable products
Handling	Throughout entire chain	Bruising leading to rot

most high-level treatment of post-harvest losses was the 1974 World Food Summit that gave rise to an ambitious programme entitled “Prevention of Food Losses” designed to reduce global food losses by 50 per cent within 10 years. See Guillou and Matheron (2011), p. 61. The authors are not aware that this reduction by half has ever been measured, and we have doubts that the goal has been reached.

²⁵ Kader (2005), Hodges et al. (2011) and National Academy of Sciences (1978) provide an overview about different approaches. See also Guillou and Matheron (2011), pp. 47–57 and pp. 66–73.

²⁶ See National Academy of Sciences (1978), pp. 159 et seqq.

The following [Figure 1](#) relates the activities in the post-harvest system to the different actors that would need to invest in physical or human capital in order to achieve higher process quality and reduce losses.

Activity	Investor
Cutting and on-field handling	Farmer, service provider
Threshing	Farmer, service provider
Drying	Farmer, service provider, processing company
Milling	Processing company
Storage	Farmer, processing company, transport company, wholesale trader, retail trader, warehouse industry
Transport and Distribution	Transport company (truckage and shipping company, railroads, ports), wholesaler, supermarket chain; State (road networks, rail networks, ports)

Fig. 1. Activities in the post-harvest system and related investors

As [Figure 1](#) illustrates, the high need for investments that facilitate an efficient and effective post-harvest process calls for a range of different investors. These investments need to be undertaken both by the state or communities (road infrastructure, again, and possibly community-based storage facilities) and by private companies, to refer to the main distinction. It needs to be highlighted that post-harvest investments of the private sector go far beyond the often quoted “processing companies” that many policymakers favor. Also, sectors that are often pointed at because of their “unproductive character” – transport and trade – play a major role in reducing post-harvest losses in developing countries. It shall also be noted, that not only long-term investments are needed. Often, for instance when it comes to timely availability of harvesting machines or access to safe threshing and milling, a lack of working capital can be an issue.

2.3 Post-harvest Losses as a Factor for Farm Income

Applying technologies to reduce post-harvest losses has a positive impact on the quality and quantity food supply to the markets and therefore a positive impact on food security. An increased supply of food will, in general, contribute to lower the cost of food for the benefit of the urban and rural poor.²⁷

Depending on the activity – if on-farm or off-farm in the farmers' range of activities – a reduction of losses directly influences the farmers' income due to an increased volume and quality of produce he or she can sell. While the gains from reducing post-harvest losses can be significant, there are also costs associated with those efforts. Thus, the investments to reduce post-harvest losses must have a positive return to be attractive for a farmer or a group of farmers in case of a shared use.²⁸ Whereas the application of some technologies of reducing losses on the farm (like on-field handling, cutting, drying or on-farm transport and on-farm storage) can also benefit subsistence farmers, all technologies related to marketing produce (like for instance transport to markets, packaging) will increase income only for commercial farmers who sell their surplus.²⁹

2.4 Efficiently Organised Value Chains Can Reduce Post-Harvest Losses

There is some evidence that a lack of inter-linkage between the different steps of the post-harvest system contributes to post-harvest losses. Losses in storage, for in-

²⁷ See Zorya et al. (2011), pp. 19-20.

²⁸ Zorya et al. (2001), pp. 21-35, give several examples of low-tech and low-cost post-harvest loss reduction technologies for cereals.

²⁹ The authors are only aware of one study that estimates or measures the impacts of reduced post-harvest losses on income and profit of farmer households. Fischler et al. (2011) evaluate the POSTCOSECHA programme in four Central America countries that consisted of a massive stimulation of production and use of small galvanized metal silos for rural households. The study shows that subsistence farmers keep almost the entire production for covering own consumption needs and by using the metal silo they have increased their food security by 30 to 35 days per year. This effect of safely stored grain (mainly maize) in metal silos for later consumption is considered the most important aspect (savings from less need to buy grain and increased resilience). Farmers with market access, on the other hand, additionally benefitted from the metal silo since they have increased their income by selling parts of their safely stored grain not at harvest time but later during the season when the prices are higher. The average additional cash income generated in this case is reported at 90 US\$/year (or 5% of the average annual cash income per family of 1800 US\$) and equals approximately the actual price of a 545 kg silo. This means that the study does not measure the isolated income effect of the reduced post-harvest loss only, but the overall effect which is intermingled with effects resulting from deferred sales. In addition to the benefits for the farmers, the analysis reveals positive income effects for the around 800 to 900 small-scale tinsmiths producing the silos, and it argues that the programme has significant price stabilizing effects in the region.

stance, may become larger because of longer storage times because of a lack of timely processing or other sales. Unavailability of transport combined with lack of storage on farm level may result in produce exposed to the risk of outside drying longer than technically necessary. Efficiently organised value chains can reduce such post-harvest losses. This happens mainly through a better organisation of marketing and of exchange processes between the actors in the agricultural value chain.³⁰ Such governed marketing efforts can take quite different forms; for storable grains and oilseeds they may include inventory credit schemes and warehouse receipt systems.³¹ Such schemes can facilitate the quick removal of the crop from the field and storage in safe and loss-minimising warehouses and silos.³² Adequately governed marketing structures may also save farmers from the necessity to sell growing crops before harvest in order to secure cash-flow, thus providing a more reliable income source.³³ Accordingly, so-called value chain financing schemes that support organised value chains may contribute to reducing food losses.³⁴

Box 2: The Ambivalent Role of Modern Food Distribution and Marketing Systems

The food distribution systems in developing countries are rapidly changing, mainly under the influence of urban, Western-based lifestyle models: Large retail chains and modern supermarkets are gaining prevalence over traditional markets and small-scale retailers selling local produce. In Brazil, for instance, around 70% of food is distributed in large supermarkets, up from only 10% 30 years ago.³⁵ From the perspective of reducing post-harvest losses, this development carries ambivalent effects: Modern supermarkets and retail chains may organize marketing of food more efficiently, and can reduce post-harvest losses in storage and transport. However, they appear to increase food losses again,

³⁰ See Hodges et al. (2011).

³¹ For a discussion of agricultural value chains and value chain finance, see Swinnen and Maertens (2013).

³² See Hodges et al. (2011) and Coulter and Shepherd (1995).

³³ Market structures for primary produce are often characterized by monopsonistic or oligopsonistic structures, i.e. there is only a limited number of buyers in an area that buy the harvest from the farmers. This results in the relatively high bargaining power of these traders since farmers have little alternative. Organized trade structures with long-term obligations on both sides are in principle suitable to reduce such bargaining power since plights of farmers shall not be used for exercising pressure on them. De Schutter (2010) examines the subject of bargaining power in global food supply chains, its potential abuse by dominant buyer, and the relation to competition law.

³⁴ See Miller and Jones (2010) for a description of different approaches of value chain financing. See also Swinnen and Maertens (2013) in this volume.

³⁵ Guillou and Matheron (2011), p. 23.

because they tend to display and sell only goods of superior aesthetic quality because of customer preference, which leads to a discharging of eatable food. Also, the tendency to sell pre-prepared food in modern supermarkets is likely to increase food waste. Which effect will dominate remains currently unclear due to a lack of studies carried out on food losses in modern urban trade and consumption structures of developing countries.³⁶

To summarise the main findings how to reduce farm-to-fork bottlenecks:

1. Increasing food supply is more than increasing agricultural production output. A significant amount of the food produced on the farm is lost or deteriorates afterwards. This happens on the farm, for instance while threshing, drying, or packaging the food, but to a significant extent after the produce has left the farm, for instance in later value chain steps of processing, transporting or trading the goods. In order to increase the security of food supply, all steps and processes between farm and consumer need to be understood and strengthened.

2. Public investment in rural road infrastructure is key. Road infrastructure forms the economic basis for practically all post-harvest activities because they are all related to transporting produce to markets or processors, or to preparing produce for these steps. Road infrastructure also influences the farmers' decision what crop to produce, or if to produce at all for the market (because markets might be physically unreachable). Thus, innovative approaches to how to finance rural road infrastructure (both construction and maintenance) need to be developed.

3. Reduction of post-harvest losses requires investments by different private actors. The above-listed investments of the private sector in processing, transport and trade can be facilitated by providing capital, i.e. investment and working capital loans, which is typically provided by banks. The clients in these sectors typically carry a different risk profile as compared to urban or non-agriculture related businesses. And banks face a similar challenge with clients in agricultural processing and trade as they face with crediting farmers, since the different actors in the value chain face the same or similar specific agricultural risks.³⁷ Thus, financial institutions need to assess and manage co-variant risks characteristic for agricultural finance, including the different value chain actors. We will explore this later. So-called value-chain financing schemes along organised value chains that govern several post-harvest steps can contribute to the financial sector by reducing post-harvest losses.

³⁶ Compare Guillou and Matheron (2011), p. 59.

³⁷ See Maurer (2013) for a discussion of risks involved in crediting farmers and the agricultural value chain.

3 The (Potential) Contribution of the Financial Sector

As developed above, investments by different types of investors are relevant in order to fuel an efficient and food-loss minimising chain from pasture to plate: The state needs to invest in rural public infrastructure. Different economic sectors are involved in the post-harvest system, and different (private) actors operate in organised value chains. They all need access to finance in order to encourage rural investments in agriculture and beyond.

Why do banks and other financial institutions not finance these activities to the extent needed?

The state. In order to boost agricultural productivity and reduce post-harvest losses, the public sector needs to invest, first of all, in public transport infrastructure, mainly in the rural road network. Rail transport and sea ports are relevant for countries that export agricultural produce. For financing such expenditure, public finance typically uses its instruments such as taxes (as well as royalties, import and other duties) and borrowings.

We do not want to enter into the discussion of public finance here. However, we would like to point to the role of municipalities and other regional administrative levels. Not least driven by policies of decentralization, local authorities become a more important player in providing and maintaining local infrastructure like for instance rural roads. The public finance system does not always provide the necessary funding for the responsibilities transferred to the communities.

But apart from investing into classic public goods like rural roads according to their legal responsibilities, we see municipalities investing in specific commercial support facilities in order to strengthen local economic growth. Examples for such services are serviced market spaces, municipal storage facilities, and municipality-run ferry-boats or river quays. For such income-generating activities, the outsourcing of services, concession models, or other forms of PPP may be a vehicle to mobilise private investment and engage the financial sector.

Primary agricultural production. Banking to farmers may be more difficult and complex than granting finance to other economic sectors, but there is no proof that agricultural finance is more risky than banking in others sectors.³⁸ Until the 1980s, the predominant approach in agricultural finance was the provision of farmer credit with subsidized interest rates, particularly via specific state programmes or state-owned agricultural banks. This approach has proven unsustainable and has regularly caused the contrary of what should have been achieved: They excluded rural poor from financial services, instead of making them sustainable and beneficial for all.³⁹ By now, it has become widely accepted that the approach of

³⁸ "No data have been found to confirm the argument that agricultural loans are more risky than others [...]" Meyer (2011), p. 46.

³⁹ There are hundreds of studies on this subject. The first publication that contributed to an abolishment of the concept of subsidized and targeted credit for the promotion of ag-

strengthening the financial system and promoting strong and efficient financial intermediaries with interest in rural clients will lead to higher-quality financial services for the poor and other previously excluded.⁴⁰

For a couple of years, we have seen several examples of well-managed and strategically positioned financial institutions which service farmers in developing countries, including smallholders.⁴¹ In particular, the financial institution's ability to perform a succinct but useful credit assessment of farming businesses with its peculiarities and an institutional ability to manage risk exposure concentrated in one sector with the agriculture-specific external risks (particularly weather, but also pests and market risks) have been critical for success.

Despite these successes, however, there is still a long way to go before service levels of the financial sector to the farming communities are satisfactory in terms of quality and quantity.

Agricultural service providers and traders. Agricultural service providers, like traders for input and machinery, commodity traders, or providers of ploughing or transport services are traditionally better served by banks, compared to the farmers themselves. Usually they are bigger in size (leading to economically more attractive, larger credit amounts); they are often more professionally run (decent book-keeping for banks to analyse); they are often located in more urban settings (thus more easily accessible); and they often own – in contrast to farmers – easily sellable collateral (like cars, stock or urban real estate). These factors make it, in principle, easier for banks to serve these actors.

However, in terms of risk-management banks face a similar challenge with clients in agricultural processing and trade as they face with farmers. Both types of customers are exposed to same specific agricultural risks:⁴² When draughts or pests lead to a reduction of produce quantity in a region, there is also less produce

ricultural production was United States Agency for International Development's 1973 "Spring Review of Small Farmer Credit". See USAID (1973). Another ground-breaking publication was Adams et al. (1984) with several important studies on the subject orchestrated by the Rural Finance Group in the Agricultural Economics Department at Ohio State University.

⁴⁰ As an overview for the transition from the old subsidized credit paradigm to the new financial system approach see Vogel (2006).

⁴¹ Several of the originally urban-focused microfinance banks of the ProCredit network, as one example, have invested more than 15% percent of their credit portfolio in the agricultural sector (Ghana, Nicaragua, Ecuador, Ukraine, Serbia, Rumania). See the different banks' annual reports (2011), accessible under www.procredit-holding.com. Another example of a commercially oriented microfinance bank having entered the rural and agricultural client segment successfully is AccessBank in Azerbaijan. See the contribution of Jainzik and Pospielovsky (2013). Meyer (2013) also refers to a number of examples. Both in this volume.

⁴² See Maurer (2013) for a discussion of risks involved in crediting farmers and the agricultural value chain.

to be put into tins by processors and to be marketed by traders. Thus, financial institutions need to carefully assess and professionally manage co-variant risks characteristic for agricultural finance, including the different value chain actors, in order to allow for the full potential of finance provision for the sector. Most financial institutions are still far from such professional management of specific agricultural risks.⁴³

The efficiency imperative. A core challenge of serving the agricultural sector and its related actors is the fact that the agricultural sector is essentially rural. Clients typically generate lower unit volumes compared to urban markets (both in credits and in savings), clients are more distant to physical branches, and branches are more distant to bank headquarters and to labour markets for qualified bank staff. These factors make service provision to rural areas more costly. Thus, in order to provide services to the countryside cost-effectively, banks need to be highly efficient. Discussions about cost efficiency in reaching the clients often focus on technological solutions, like cell-phone banking as has been mentioned before. But any technological approach needs to be embedded into a clear strategic view how to service rural markets, which may include a distinction between services than can be offered efficiently, and others that shouldn't be offered by the respective financial institution.⁴⁴ Product designs and of process organization need to fit to client needs in order to reach out into rural areas. Core strategic questions that financial institutions need to answer are for instance: Which clients can we serve, and which may remain excluded from our service? Which products can gain enough scale in rural areas in order to be distributed efficiently? What degree of standardization and simplicity of products is adequate in rural areas so that less literate clients can still understand, and potentially less qualified bank staff can still explain to them? What is the best distribution approach for our products? Individual lending or group-based approaches where parts of the distribution costs are passed on to village groups?

In this context, cross-selling opportunities for financial institutions have a critical influence on the cost-income-ratio; the ability to use infrastructure (like branches, cash points, etc.) not only to extend credits, but also for savings services, money transfers and other services which can help banks to make best use

⁴³ For the different risk-management approaches, see Maurer (2013). To a certain extent, financial institutions can manage specific agricultural risks and limit its potential negative effects internally by applying exposure limits, diversification rules for the institutions portfolio, diversification requirements for the farming business and other measures. If the risk-bearing capacities of financial institutions are exhausted despite of the application of such measures an outplacement of risks can enable them to enlarge agricultural lending without exposing the institution to inadequate risk levels. For the role of agricultural insurance in developing countries see Herbold (2013), for the potential role of structured finance see Hartig et al. (2013), both in this volume.

⁴⁴ Some services, like for instance payment services, might be better offered by non-banks, like mobile telecommunications companies.

of its infrastructure.⁴⁵ Thus, traditional, specialised agricultural banks, often providing only credit, are likely to be less cost-effective than full-service banks that provide a wider set of services to a wider range of customers, i.e. not only farmers but also other clients who live in the countryside.

We feel that many of (micro) finance institutions lack the necessary rigour in defining and designing their product offers and the corresponding process organization to provide services to rural communities with the outmost efficiency. Applying such rigour may result in painful choices, since it may well lead to consciously not meeting some demands on parts of the rural population. But the lack of efficiency in process organization is the main impediment to the rural penetration of financial services.

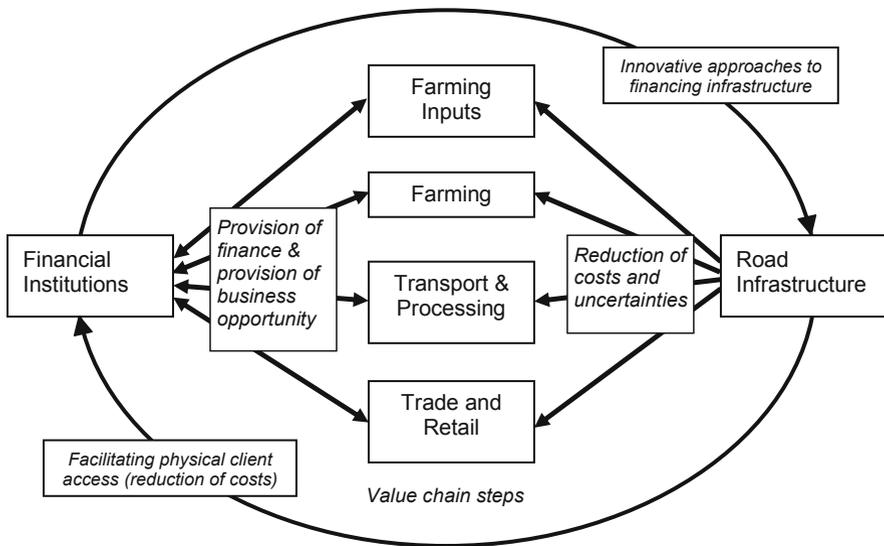


Fig 2. The re-enforcement potential between holistic rural finance, road infrastructure and the agricultural value chain

⁴⁵ Hartarska et al. (2009) have done an econometric analysis over 750 microfinance institutions worldwide, concluding that the provision of both savings and credit leads to significant economies of scope, i.e. potential cost saving effects. They found that scope economies would not necessarily come from lower costs of capital due to deposit collection. Scope economies seem to be a result of fixed cost distribution and costs interaction among the different products. However, it also turned out that reaching scope economies seems to be harder in rural settings compared to urban areas.

4 Conclusion

In order to develop agricultural and rural finance into a relevant tool to contribute to food security, a holistic approach is needed that addresses not only the farmers' need for finance, but also the investment and finance needs of further actors in the value chain. To include these actors is particularly important since they can make an important contribution to reduce the food losses that occur after harvesting, thus helping to make more food available in the market which potentially may also bring prices down for consumers.

The role of the state, particularly for investments in rural transport infrastructure, needs to be re-emphasized. Getting infrastructure conditions right contributes significantly to both food production and reduction of post-harvest losses.

The financial sector has not done its homework yet: Innovative approaches how to employ public-private partnerships in order to finance public goods and joint service provision for actors in the agricultural value chain remain limited. Only a limited number of banks and microfinance institutions have so far developed and implemented adequate risk assessment and risk management tools in order to increase lending to farmers and other actors in the value chain which all are subject to specific (covariant) agricultural risks. And only a limited number of banks and microfinance institutions have reached a level of efficiency in process organization – which is interlinked with product design – that allows for deeper outreach into rural areas.

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