Value chain financing: evidence from Zambia on smallholder access to finance for mechanization

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Smallholder farmers in Zambia comprise 85 per cent of the farmers' population. Such farmers are regarded as not creditworthy and furthermore their agricultural productivity could be improved. The aim of this paper is to present recent evidence on value chain financing (VCF) as a framework to increase access to agricultural finance for Zambian smallholder farmers. Such financing will act as an enabler to mechanize and, in turn, might improve productivity. Qualitative data collection techniques were followed to provide the results as presented in three illustrative case studies. Each case study highlights the benefits of financing, using the value chain framework, but also emphasizes certain challenges and risks associated with the approach. The Zambian case is not perfect, but provides recent evidence of how various roleplayers in Zambia's agricultural sector have applied the VCF framework to coordinate the actions of various chain actors, and by doing so allow smallholders access to finance within the local and country-specific context. Although two of the three VCF programmes have been discontinued, they still provide useful learning points: for instance, commercial banks should assign more resources to manage the VCF products; and the risk should be shared between all the VCF participants.

Keywords: agricultural value chain financing, Zambia, mechanization, collateral, credit, smallholder farmers

THE POTENTIAL OF SMALLHOLDER FARMING has not yet been fully realized, although it is responsible for 70 per cent of the food supply in Africa (Steinmann, 2014). According to a recent report by the Food and Agricultural Organization (FAO) on food insecurity in Africa (2015), priority must be given to economic growth in this sector as agricultural investment is an effective way to: 1) reduce poverty; 2) promote agricultural productivity; and 3) enhance environmental sustainability (FAO, 2012). Value chain financing (VCF) is a financing framework or approach involving funds flowing throughout the value chain and in turn improving the efficiency within the chain (Miller and Jones, 2010). VCF has been highlighted as a way to reach out to smallholder farmers by reducing both the cost and the risk in financing (Miller and Jones, 2010).

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In view of the above, a renewed focus on the investment needs of and developmental support for smallholder farmers is critical, as the various financial needs of smallholder farmers remain unsatisfied (IFAD and UNEP, 2013). On the other hand, according to Fan et al. (2013), the development of smallholder farmers depends on a country's level of transformation within its economy. Transformed economies are countries in which agriculture's contribution to the economy is minor (Fan et al., 2013). Most sub-Saharan African (SSA) countries are agriculture-based economies, with a significant portion of the economy dependent on growth of the agricultural sector (Fan et al., 2013). Oberholster et al. (2015) added that agriculture-led growth can be effective in reducing poverty when farmers, including smallholder farmers, are granted access to appropriate financing solutions for their agricultural endeavours.

Additionally, food production in SSA is not keeping up with population growth. Although crop yields in the developed and developing world have increased steadily over the last 50 years, yields in Africa have generally remained around 1 tonne per hectare, or even less (Tittonell and Giller, 2013). Closing this yield gap by boosting productivity is a key component of poverty reduction for smallholder farmers (Norell et al., 2015).

Smallholder farmers in Zambia comprise 85 per cent of the farmer population, with the agricultural sector contributing an estimated 10.8 per cent to the country's GDP (CIA World Factbook, 2015). For the purposes of this study, farmers cultivating 40 hectares or less are referred to as smallholder farmers. Furthermore, in 2009 the agricultural sector employed some 67 per cent of the Zambian labour force (World Bank, 2009). It can therefore be gathered that the Zambian economy is still predominantly agriculture-based. Large-scale farming operations in Zambia are generally highly mechanized, but this is not the case with smallholder farmers (Aregheore, 2009). There is, however, opportunity in this country to increase the mechanization of smallholder farming operations which, in turn, will improve productivity, though this will require smallholder farmers to have increased access to agricultural finance. Patil et al. (2016) argued that one of the reasons smallholder farmers lack the ability to reap the benefits of a globalized market is their limited access to credit.

A further issue which has presented itself in the problem described is that smallholder farmers are deemed not to be creditworthy. Moreover, financiers are often reluctant to extend credit to smallholder farmers as the risk of non-payment is high, with little or no collateral available in the event of default (Fakudze and Machethe, 2015; Patil et al., 2016). Collateral is regarded as a key component in lending, with land representing the traditional form of collateral (Anseeuw and Ducastel, 2013; Middelberg, 2013). Yet, based on the 1995 Land Act, all land in Zambia is classified as 'customary land' with guidelines for transferring customary land to leasehold title (Sitko and Chamberlin, 2016; Sitko et al., 2014). The administration of such land includes gaining the approval of traditional rulers such as chiefs and headmen. Based on research conducted by Sitko et al. (2014), the application of regulations and procedures when allocating leasehold titles is inconsistent, which in turn constrains existing smallholder farmers from acquiring title to their land. According to Aregheore (2009), few smallholder farmers possess

land with title deeds, with the majority of them having customary *use* rights only. This reiterates the argument that smallholders lack collateral in the form of leasehold titles when applying for agricultural credit. Hence, Oberholster et al. (2015) reiterated the need for new and innovative agricultural financing solutions that are commercially viable.

Smallholder farmers in Zambia require access to financing to improve their productivity and subsequently provide food security. Financiers, however, are generally reluctant to extend agricultural credit to smallholder farmers as they are deemed not to be creditworthy. The reasons are, among others, that their loan repayment capacity is low and that they lack traditional collateral in the form of agricultural land title (Patil et al., 2016; Sitko et al., 2014). Zander (2016) furthermore highlighted that commercial financial institutions find the provision of *agricultural* finance particularly challenging. This is because the rural population is less dense and rural infrastructure less developed, while access to information in these areas proves difficult and more costly. Furthermore, the commercial banks' soft skills and their systems and procedures for providing financial services to value chain participants are often not well developed (Zander, 2016).

Within this context, it is argued that VCF is a possible framework for increasing smallholder farmers' access to agricultural financing as an enabling force to mechanize and provide food security.

This paper thus aims to explore agricultural VCF as a financing framework in Zambia for the purposes of agricultural mechanization. It also investigates the benefits and challenges of using the VCF framework in that country.

The paper is structured as follows: first, the researcher presents a literature review, then examines the problem. The next section describes the research design, then analyses the case study results and lessons learned. A final discussion concludes the paper.

Literature review

Value chain financing (VCF)

The concept of a value chain is used in varying ways in literature (Horton et al., 2016). According to Horton et al. (2016) a value chain refers to 'the sequence of interlinked agents and markets that transforms inputs and services into products with attributes that consumers are prepared to purchase'. Numerous multidisciplinary studies have been conducted on the use of this concept in the agricultural domain (Fearne et al., 2012; Jordaan et al., 2014; McMichael, 2013; Ricketts et al., 2014; Swinnen and Maertens, 2007; World Bank, 2009), with the concept also having found practical application in agricultural sector financing (African Development Bank, 2013; Bajwa, 2013; Coates et al., 2011; Fakudze and Machethe, 2015; Johnston and Meyer, 2008; Kopparthi and Kagabo, 2012; Lynam and Theus, 2009; Miller, 2012; Miller and Da Silva, 2007; Miller and Jones, 2010; Oberholster et al., 2015; Patil et al., 2016; Shwedel, 2006; Soundarrajan and Vivek, 2015; Swamy and Dharani, 2016; Zander, 2015, 2016).

The flow of credit among the various actors in the chain comprises what is known as agricultural value chain financing (Miller and Jones, 2010). These chain actors add value to the agricultural produce from its input to the delivery of the final product to the consumer (Patil et al., 2016). According to Soundarrajan and Vivek (2015), innovative ways to structure the finance fittingly in order to minimize transaction costs and reduce risk have to be found. Optimally functioning agricultural value chains therefore make use of financial products that meet specific needs within the local and country-specific context. Furthermore, the credit risk is significantly reduced by the techniques used to distribute and collect funds (Oberholster et al., 2015). It is critical for VCF success that an effective lead chain actor is identified to provide either a guaranteed sales agreement or, alternatively, direct financing – which then enables access to finance from a third party (Miller and Jones, 2010; Soundarrajan and Vivek, 2015). Agribusinesses and NGOs have the potential to be effective lead actors since: 1) they have an extended rural footprint; and 2) they have close relationships with their customers. This allows a hands-on approach in managing the VCF credit risk. The relationship between the lead chain actor and the smallholder farmer can play an important role in facilitating access to financial services (Oberholster et al., 2015).

It can therefore be gathered that VCF is a framework built on existing good relationships between value chain actors, such as agricultural producers, input suppliers, processors, traders, exporters, and retailers (African Development Bank, 2013; Miller, 2012; Miller and Jones, 2010; Webber and Labaste, 2010). It is regarded as a financing framework designed to connect farmers to markets (McMichael, 2013).

A number of studies have found that access to finance through VCF had positively impacted smallholder livelihoods (Fakudze and Machethe, 2015; Kopparthi and Kagabo, 2012). In contrast to this, it is also argued that there are still many challenges to be overcome (Swamy and Dharani, 2016). It is critical that research be contextualized through country-specific cases (Kopparthi and Kagabo, 2012; Oberholster et al., 2015; Swamy and Dharani, 2016) rather than generalized (Patil et al., 2016).

Swamy and Dharani (2016) analysed agricultural VCF approaches and tools in India. They presented multiple case studies of Indian agricultural VCF methods. It is argued that value chain models should be reviewed, and furthermore that other financing options should be evaluated for each value chain participant.

Zander (2015) identified new trends in agricultural VCF to highlight what works, what does not, and the reasons thereof. A number of case studies following the VCF approach were discussed in this publication, and it is argued that better coordination and cooperation between producers and financial institutions are required to ensure improved financing on all layers of the various value chains (Zander, 2015).

A country-specific study by Kopparthi and Kagabo (2012) raised the question of whether VCF could offer a possible solution to Rwandan small-scale farmers' limited access to finance. It was found that the introduction of VCF had indeed positively improved Rwandan smallholder farmers' livelihood.

Other researches which also focused on country-specific agricultural value chains on the African continent include that of Oberholster et al. (2015), the African Development Bank (2013), Coates et al. (2011), Webber and Labaste (2010) and Larsen et al. (2009). The study by Oberholster et al. (2015) focused on promoting the success of agricultural VCF in South Africa. The African Development Bank (2013) conducted a continent-wide research on the concept of agricultural VCF in Africa and its development for purposes of increased export competitiveness. The paper considered agricultural VCF case studies from various African countries, namely Ghana, Kenya, Tanzania, and Rwanda, but Zambia was not included in the investigation. Coates et al. (2011), in a study funded by the German Development Cooperation (GIZ), examined the financing of agricultural value chains in Africa with the aim of identifying strategies and tactics to improve access for commercially oriented agricultural value chains. The countries analysed included Kenya, Ghana, Burkina Faso, and Ethiopia. Furthermore, in 2010, the World Bank conducted a study on bolstering Africa's agricultural competitiveness, which focused on providing a guide to value chain concepts and applications (Webber and Labaste, 2010). The report documented a number of case studies, using comparative analysis.

Larsen et al. (2009) conducted four African country studies on Ghana, Kenya, Tanzania, and Uganda. Their investigations suggested that innovation in agricultural financing was already under way in SSA value chains; however, local, context-specific programmes were identified as critical to the success of VCF.

This paper differentiates itself from the extant literature by providing what the author deems insight into how the adoption of a VCF approach could provide Zambian smallholder farmers with access to agricultural finance for mechanization. In line with the argument of Larsen et al. (2009) that local, context-specific programmes are crucial, this paper provides a Zambian-specific context.

Food security and mechanization

Food security in sub-Saharan Africa is affected by the following forces (Hatch et al., 2013): 1) growing demand for food; 2) political instability; 3) climate change; 4) food price volatility; 5) limited infrastructure; and 6) low productivity levels. Each one of these forces or challenges requires attention, but this paper will focus on low productivity levels.

To increase agricultural production levels, the production processes need to improve (Hatch et al., 2013). As already indicated, 85 per cent of Zambia's farmers can be categorized as smallholder farmers. They face major challenges, including low yields, poor quality products, high wastage, high input and labour costs, and poor resource utilization (Aagaardt, 2011; Mungalaba, 2015). Many of these challenges can be addressed through the mechanization of the production process. Mechanization is defined by Onwude et al. (2016) as 'the application of equipment, machinery and implements in farm activities to improve the productivity of the farm labour and of land, in order to maximise marginal output

and increase agricultural and food production'. According to Aagaardt (2012), relatively few private tractors are used for ploughing and haulage in Zambia, with the exception of large-scale farmers. Traditionally, 30–40 per cent of smallholder farmers hire either oxen or manual labour for land preparation services and later for weeding. Aagaardt (2012) investigated the viability of a mechanized conservation farming (CF) service as opposed to the alternatives currently being used by smallholders. CF practices prevent erosion and nutrient depletion through protection of the soil (Mungalaba, 2015). The study by Aagaardt (2012) considered the choices available to smallholder farmers as well as estimated the time and cost of each option. The results indicated that mechanized CF practices offered a positive alternative. Mungalaba (2015) concurred by recommending increased mechanization of conservation agriculture in Zambia. A study conducted in 2003 indicated that, at that time, approximately only 10 per cent of Zambia's smallholder farmers had adopted CF practices (Haggblade and Tembo, 2003).

According to joint research by IFAD and UNEP (2013), present agricultural practices are undermining the ecological foundation of the global food system. Degradation of the soil is worsening, which in turn reduces ecosystem capacity to generate sustainable yields. The result is that both food security and poverty reduction are negatively affected.

Research design

This study was conducted from an interpretive stance following inductive reasoning, using qualitative data collection techniques. Using funds secured from the Chartered Institute of Management Accountants (CIMA), the researcher undertook two one-week field trips to Zambia and interviewed 14 respondents face to face. Various value chain actors and commercial banks in the Zambian agricultural sector took part: 1) the chief executive officer, chief financial officer, and commodities manager of a Zambian agribusiness involved in providing inputs, financing, and off-take agreements to smallholder farmers; 2) the agricultural Head of Africa at a commercial bank; 3) two relationship managers from different commercial banks offering agricultural finance; 4) the mechanization manager of an organization participating in a number of the agricultural value chains in Zambia; 5) the executive manager of a prominent Zambian farmers' organization; and 6) an associate and analyst from an organization providing debt and equity finance to agribusinesses working with Zambian smallholder farmers.

Individual interviews were scheduled and arranged with each respondent. The interviews were kept open, using semi-structured questions to get a comprehensive picture of respondents' perceptions and leave room for the emergence of issues the researcher might not have considered previously (Greeff, 2011). Focusing on the financing of Zambian smallholder farmers, the interviews covered three financial products that have been offered to these farmers. Furthermore, the various challenges facing value chain actors in their respective

roles were also discussed, as well as the benefits already reaped by them. The interview results were then documented in three separate illustrative case studies (the three financial products) that identified the value chain actors, as well as the benefits and challenges faced in each illustration. The draft report was sent to the interviewees for final approval. The aim with documenting the results in the form of case studies was to deliberate over the nature of management accounting in practice (Scapens, 1990). Furthermore, according to Scapens (1990) as well as Otley and Berry (1994), the illustrative case study attempts to demonstrate innovative practices by describing real-life situations interpreted in the light of a theoretical standpoint. Yin (2014) reiterated that case study research allows an understanding of complex social phenomena.

Case study results

The three independent case studies offer a practical illustration of VCF in Zambia. Each represents a different stakeholder requiring financing with varying objectives. The benefits and challenges that VCF has brought to each case study is also highlighted. The key information on each case study is listed in Table 1.

Table 1 Key information on case studies

Case study	*Key actors*	*Objectives*	*Details on financing*
1	CFU (lead chain actor) Smallholder farmers Input suppliers	Expanding area cultivated according to CF principles	Size of loan: value of tractor and ripper Loan period: 3 to 4 years Deposit: 20% Collateral: equipment
2	Agribusiness (lead chain actor) Smallholder farmers Input suppliers	Promoting agribusiness brand of agricultural inputs Smallholder crops delivered to agribusiness	Size of loan: value of tractor and ripper + value of input supplies Deposit and loan terms varied between three commercial banks Collateral: equipment
3	DAZ (lead chain actor) Cooperative Smallholder farmers Input suppliers Processor	Improve access to finance for dairy farmers	Member of qualifying cooperative Farmer has certain criteria to be met Size of loan: value of one cow Loan period: 3 to 5 years Bank remains owner until loan is settled

Note: CFU, Conservation Farming Unit; DAZ, Dairy Assocation of Zambia

Case study 1

The Conservation Farming Unit (CFU) is an independent organization that has been operating in Zambia for almost two decades. The organization is funded by the Norwegian Government, with the key aim of promoting 'climate-smart' agriculture by offering free training in CF practices.

The organization has numerous field officers who operate in regions throughout Zambia. The field officers have, in due course, formed close relationships with the Zambian farming community and have realized that the CFU's progress in enhancing CF practices could be greatly accelerated if the agricultural production process is mechanized. In Zambia, as mentioned before, relatively few tractors are utilized by smallholder farmers for ploughing and haulage, as the land is mostly prepared using oxen or through manual labour. The aim of mechanizing the production process is twofold: 1) to expand the area cultivated according to 'climate-smart' principles; and 2) to shift farmers from smallholder- to medium-scale production by increasing the area. The CFU envisages that, if farmers could switch from manual labour to the use of a tractor and ripper for ploughing and haulage, both their set aims could be achieved.

On the other hand, the CFU appreciates that these smallholder farmers are not deemed creditworthy since, generally, they have no previous credit record and no or limited collateral. The CFU has therefore assumed the role of lead chain actor by enabling access to finance through approaching a third party, i.e. a commercial bank (see Figure 1), for funding these smallholder farming operations. Based on the relationship between the CFU and the smallholder farmers, the commercial bank agreed to finance the latter. The initial role of the CFU in the value chain was to offer agricultural extension services by advising farmers on conservation farming practices. Their long-term goal, however, is to empower the smallholder farmers by following conservation farming practices.

The CFU has the potential to assume the role of lead actor because: 1) it has an extended rural footprint in Zambia; and 2) it has built strong relationships between its field workers and the smallholder farmers.

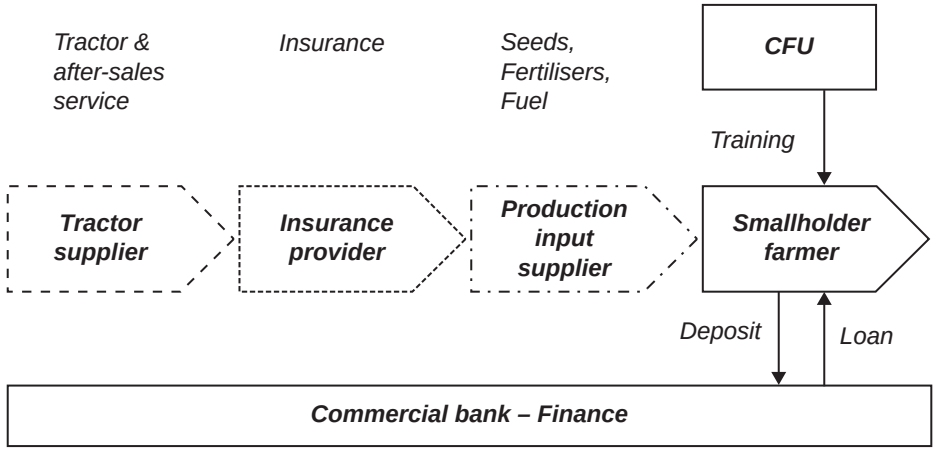

Figure 1 Case study 1: value chain actors and commercial bank

The CFU field workers assist the commercial bank with the initial selection process of smallholder farmers that might qualify for a loan. Furthermore, as many of these smallholder farmers are illiterate, the CFU field workers assist them in preparing their credit applications. The ultimate decision on the granting of credit lies with the commercial bank's credit department. The repayment obligation remains with the individual eligible smallholder farmer and not with the CFU. To mitigate its risk exposure, the commercial bank conducted an evaluation of the CFU's ability to assess risk and select credible farmers, as well as its ability to monitor an agricultural loan. The CFU did not receive a commission for facilitating the process.

The size of the loan is large enough to purchase a tractor as well as a ripper, and the loan is repayable within three to four years. The farmer is required to pay a deposit of 20 per cent on the value of the equipment. To assist in the sustainability of the mechanization process, and as part of the purchase agreement, the tractor provider has to offer an after-sales service and the farmer is furthermore required to insure the equipment. To overcome the barrier of deficient collateral, the financing product has been structured in such a way that the equipment serves as collateral. In case the smallholder farmer defaults on the loan payment, the commercial bank can repossess the tractor and ripper. The smallholder farmers use the income generated by the enhanced agricultural production to pay the instalments on the loan. This product was initially offered to a limited number of smallholder farmers who met the required qualifications and were accepted onto the project.

The VCF actors in this case study are: 1) the CFU (lead chain actor); 2) the Zambian smallholder farmers; and 3) various input suppliers including tractor, insurance, and production inputs. The commercial bank is not a value chain actor, but rather an institution willing to get involved as a result of the standing and interdependence of key actors in the chain. The regulatory environment for commercial banks in Zambia has fewer restrictions than in South Africa, for instance.

This case study offers a practical example of agricultural VCF. The individual smallholder farmer does not qualify for a loan if there is no relationship with the lead chain actor, i.e. the CFU. Based on the interviews held with the respondents, the benefits of the VCF transaction are perceived to be widespread. Firstly, the smallholder farmer's productivity is greatly increased: 1) better yields are achieved; 2) a crop of higher quality is grown because planting as well as harvesting can be done at the right time; and 3) planting and harvesting times are reduced with less wastage because they take place at an appropriate time.

Secondly, the farmer's financial wellbeing is improved on two levels. To start with, the tractor and ripper are income-generating assets; that is, the farmer can provide land preparation services to surrounding farmers for profit, which subsequently benefits the surrounding farmers in terms of increased productivity. Then, as a result of the increased productivity, the farmer's profit margin increases, which could lead to an expansion of the area under agricultural production.

Thirdly, the sustainability of the agricultural land is greatly enhanced by following the CF practices taught by the CFU. These practices lead to better soil conservation, which consequently reduces the effects of climate change. As agriculture is often

blamed as a key contributor to climate change, the application of these practices highlights the sector's willingness to work against its effects.

Fourthly, the social consequence of the VCF transaction is distinct. The direct effect of a farmer owning a tractor and in turn using it to improve the livelihood of the surrounding farmers is that his social standing in the community is elevated. Furthermore, less manual labour is required by the farmer. As the children of smallholder farmers are generally included in the manual labour tasks, they are now free to attend school and further their education. In addition, the local economy is boosted because these individuals spend more as a result of their increased profits. Another indirect impact of the CFU initiative is increased employment. As the farmer (and surrounding farmers) shifts from his or her status as a smallholder farmer to that of a medium-scale one, there is a greater need for inputs, transport to the markets, and seasonal harvesters, thus contributing to higher employment. Furthermore, as the farmer expands the area under cultivation, more arable land is utilized, leading to optimal use of the arable land available in Zambia.

On the other hand, the challenges of offering agricultural credit through the value chain approach can be described as constituting moral risk. One such risk is that smallholder farmers sell their produce and obtain cash, but fail to settle their loan agreement and consequently dishonour the contract they have with the commercial bank. The researcher has established that, since the initial interviews were held, the commercial bank has decided to temporarily stop offering this product. This decision is elaborated on in the concluding discussion.

Case study 2

The concept of mechanization success was initiated by a Zambian agribusiness keen on expanding its footprint in the country. The agribusiness aimed to achieve this by: 1) promoting its brand of agricultural inputs; and 2) contractually obligating the smallholder farmers to deliver their crops to the agribusiness.

The agribusiness developed an initiative similar to the mechanization scheme devised by the CFU. As in the case of the CFU, the Zambian agribusiness acted as the lead chain actor. However, in this instance the agribusiness provided a guaranteed sales agreement. By increasing the smallholder farmer's mechanization levels, productivity also increases, thus leading to additional and higher-quality products. As the lead chain actor, the agribusiness approached a third party to fund tractors and rippers on behalf of the smallholder farmers. The third party, three different commercial banks, agreed, on the condition that the smallholder farmers would be required to pay an initial cash deposit. In addition, each bank's loan repayment terms varied with regard to interest rates and loan period. The agribusiness facilitated the relationship between the banks and the smallholder farmers. The agribusiness evaluated the creditworthiness of the farmer, then wrote a letter of recommendation to the bank on their behalf. Similarly to Case study 1, the ultimate credit review and approval of a credit application were conducted by the commercial banks. The commercial banks also evaluated the agribusiness's ability to assess risk,

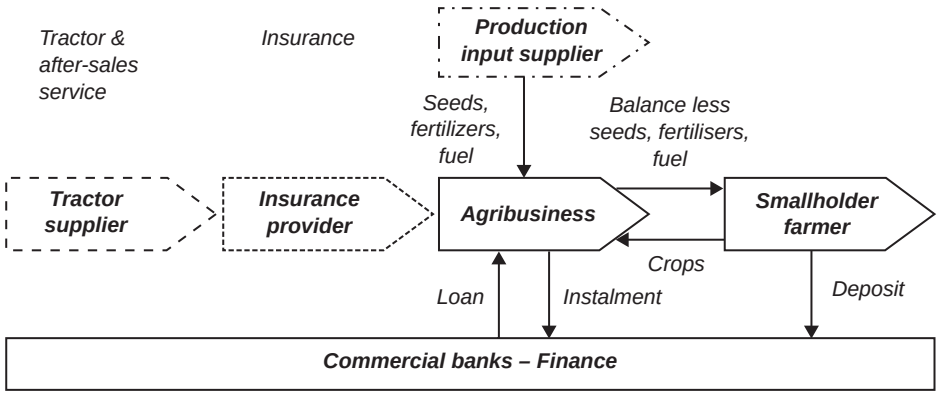

Figure 2 Case study 2: value chain actors and commercial banks

its selection process of credible farmers, and its ability to monitor an agricultural loan. No commission was received by the agribusiness for facilitating the process.

The agribusiness approached a single tractor supplier, requesting the supply of tractors and rippers combined with an after-sales service.

The VCF actors (see Figure 2) in this case study were: 1) an agribusiness (lead chain actor); 2) Zambian smallholder farmers; and 3) various input suppliers, including the tractor supplier, insurance provider, and other production input suppliers. Similarly to the first case study, the commercial banks were not value chain actors, but provided financing based on the relationship with the lead chain actor.

The contract with the smallholder farmers was structured as follows: the smallholder farmer qualifying for a tractor and ripper loan at one of the three commercial banks would be contractually obligated to take all the required production input supplies from the agribusiness. These input supplies included seed, fertilizers, fuel, etc., and would be provided on credit. The smallholder farmer was obligated to deliver his or her crops to the agribusiness based on the guaranteed sales agreement. From the proceeds payable to the smallholder farmer, the agribusiness would then deduct the bank's loan instalment and the amount owed for the input supplies. The balance would be paid to the smallholder farmer.

The benefits to the agribusiness, as highlighted by them, included meeting their set objectives of promoting their brand of input supplies and obtaining the smallholder farmer's produce. The agribusiness could sell on the smallholder farmer's produce at a profit or use it in processing to add value to the product. The challenges that the agribusiness faced in the first year of this scheme were extensive. The first challenge lay in inadequate policies and procedures in terms of the smallholder farmers' credit vetting. This resulted in some bad debts that had to be written off by both the commercial banks and the agribusiness. Another challenge could also be construed similar to the first case study; that is, moral risk. This risk involved the possibility of the smallholder farmers ignoring the contract they had with the agribusiness and selling their crops to an alternative buyer, a practice commonly referred to as side-selling. Consequently, the agribusiness could lose the income from selling the crops

and inherit bad debts that it had to carry. The third challenge was that smallholder farmers struggled to have cash available for the initial deposit.

To address these challenges, the agribusiness and banks involved firstly attempted to refine the process by improving the credit vetting procedures to avoid the risk of side-selling. As in the first case study, the agribusiness and three commercial banks have since temporarily stopped offering this financial product. A number of the challenges have to be addressed first and refinements to the financial products made to reduce the risks of credit default (refer to the discussion section in the conclusion).

However, the benefits of the VCF to the smallholder farmers are still relevant and similar to those realized in the first case study. The benefits, as communicated by the respondents, include increased productivity in terms of higher yields per hectare and higher-quality products. They are achieved because planting and harvesting can occur at the right time and in a timely manner. Furthermore, as these farmers have a guaranteed off-take for their produce, i.e. the agribusiness, the risk of wastage through not having a readily available market is greatly reduced.

Case study 3

The third case study involved the Zambian dairy sector. The challenge of financing this sector is similar to other industries, as the farmers are either subsistence or smallholder farmers, and as such lack collateral. It emerged during the interviews that these farmers have generally not fully developed their skills and there is also a lack of innovation, that is to upscale from subsistence to commercial farmer status. One of the local commercial banks agreed to a financing product referred to as 'loan-a-cow', facilitated by the lead chain actor, the Dairy Association of Zambia (DAZ). The aim of the product is to improve the access of smallholder farmers to financing, whereby a loan is granted by the commercial bank to enable a farmer to purchase one cow. Figure 3 denotes the value chain actors in this financing approach. The commercial bank is not regarded as a value chain

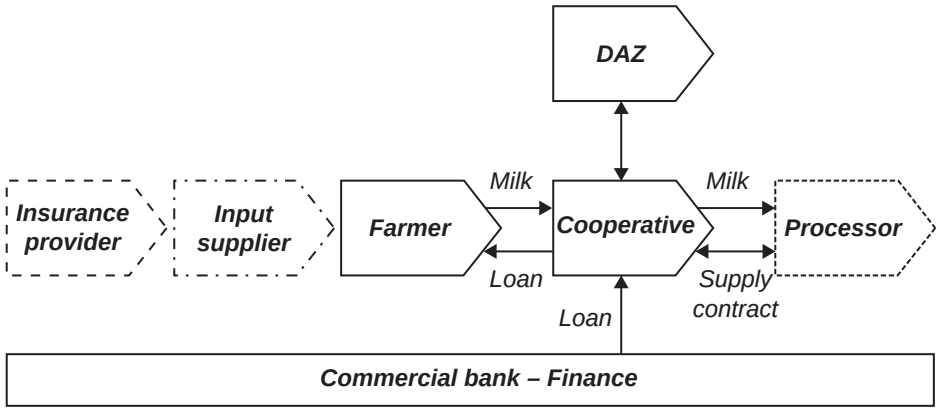

Figure 3 Case study 3: value chain actors and commercial bank

actor, but financing is granted by the commercial bank based on the relationship with the DAZ.

In this case the loan is not granted to an individual farmer, but rather to a cooperative. The cooperative model has both social and economic dimensions, with the ability to mobilize social capital and furthermore meet the economic and social dimensions of sustainable development.

The following conditions have to be met by a cooperative applying for a loan: 1) it has to have been in existence for more than three years; 2) a supply contract with a processor has to be in place; and 3) it has to be a member of the DAZ.

The farmers, on the other hand, also have to qualify for this financing approach by meeting the following conditions: 1) they must have been dairy farmers for at least one year; and 2) they must complete a business plan facilitated by staff from the DAZ.

The 'loan-a-cow' approach functions as follows: the farmer does not need collateral. However, with the assistance of the DAZ, the farmer completes an individual bank credit application form. The commercial bank does not issue the loan to the farmer, but rather to the cooperative. The cooperative then passes the loan on to the farmer. As part of the loan agreement, livestock insurance on the cow is taken out. The farmer has to repay both the loan instalment and the livestock insurance premium annually. The loan amount has to be settled within three to five years. The bank remains the owner of the cow until the loan has been repaid in full.

The farmers deliver their milk produce at processor-owned milk collection centres strategically located throughout the area. The processor pays the cooperative either fortnightly or monthly and the cooperative then pays the farmers. One of the advantages of this financing approach is that the economic life of a cow is generally between 8 and 12 years. A farmer can therefore settle the debt between three to five years and still reap the economic benefits for a number of years or alternatively qualify for another loan to buy another cow. Another advantage is that the cow could also calf down. In this way the farmer can expand his herd, the quantities of milk produced, and subsequently increase his or her income.

The DAZ is responsible for screening the cooperatives. At the time of the interviews, 67 cooperatives were members of the DAZ. These cooperatives each consist of 11 or 12 dairy farmers making use of the 'loan-a-cow' financing approach.

Notwithstanding the number of benefits to the farmers and processors, a number of possible risks were identified in practice. Firstly, the cow is not easily identifiable and therefore control of this asset can be a problem. This risk, however, appears to be low. Secondly, a possible risk is inherent in the side-selling of the milk. It was found that the market is well established in rural areas, resulting in reduced risk of side-selling. Thirdly, as milk is delivered at milk collection centres, the duration, quality, and volume of the milk can be questionable. This risk is mitigated, however, through training provided to the farmers by the DAZ. It was highlighted that, in the past, Zambian dairy farmers held poor reputations, but that this has improved through: 1) training provided to heighten financial interest; and 2) advisory services.

The challenges faced by dairy farmers include restricted access in terms of grazing area, as much of the land can only be accessed with traditional rulers' permission. Another challenge includes high interest rates charged by commercial banks.

This financing approach is similar to the Nestlé model in India (Gandhi and Jain, 2011) where the benefits to producers are evident. Another example can be found in Kenya where a credit revolving programme was set up between a milk processor, feed manufacturers, and the milk producers (Lynam and Theus, 2009).

Lessons learned

VCF is a popular financing concept and it has been proven in Rwanda that it can increase the access of smallholder farmers to finance as well as improve their wellbeing (Kopparthi and Kagabo, 2012). However, the first two Zambian-based case studies cannot be regarded as successful yet; the agricultural VCF framework requires refinement to enhance the effectiveness of the product for both financial institutions and smallholder farmers. This is similar to recent evidence from India (Swamy and Dharani, 2016). Furthermore, it is highlighted by Zander (2016) that banks and other financial institutions are understandably reluctant to disclose operational and performance details of products because of confidentiality concerns. Notwithstanding, although one of the respondents, a commercial bank, did not disclose the detailed reasons why the first two financing products were temporarily stopped, it did identify and disclose the following areas that require attention before the first two financing products can be offered again:

- More commercial bank resources should be dedicated to the monitoring and management of these financial products, including: 1) a heightened involvement by the bank in the selection of the eligible smallholder farmers; and 2) more vigilance on the part of the bank in demanding progress reports (such as pre-harvest and germination reports) from agricultural extension officers.
- Sharing the risk among all the stakeholders including the equipment suppliers.

These findings concur with those of Zander (2016) that the systems and procedures of commercial banks providing financial services to value chains in agriculture are often not well developed. Furthermore, one of the areas identified for improvement by Zander (2015) included better cooperation and coordination between farmers and financial institutions to enhance improved financing.

Final discussion and conclusion

Smallholder farmers require access to financing to improve productivity through mechanization. However, financiers in Zambia are reluctant to provide financing as smallholder farmers generally lack repayment ability, and traditional collateral in the form of agricultural land is limited in Zambia. The paper has explored the framework of VCF for Zambian smallholder farmers as an enabler to mechanize and provide food security.

The three case studies presented suggest that VCF can be used in such a way by Zambian smallholder farmers; however refinement of some of the current VCF products offered is necessary. A number of lessons have been learned by the various value chain participants, especially the financiers.

Although these Zambian cases are not perfect, they provide recent evidence of local and country-specific context of agricultural VCF. These case studies could be utilized by investors/financiers keen on expanding their footprint in Zambia. The cases could sensitize such investors/financiers to some of the issues and lessons already learned when providing or applying for finance. Furthermore, policy-makers keen on promoting investment in the Zambian agricultural sector could consider the findings of this study when formulating policy. This could include possible measures limiting the moral risk of side-selling, providing assistance in terms of grants available for deposits when using the funds for mechanization, and restricting the interest rates charged by banks when offering agricultural credit for mechanization. As in Case study 3, training to heighten financial interest could also be provided to the smallholder farmers.

The research raises important questions about what refinements are required to improve the current VCF models to ensure sustainability of the products offered. Furthermore, the topic of how extensively the VCF approach is used in Zambia, and the correlation between access to financing through the VCF approach and productivity, can be investigated. These questions highlight the study's limitations, with opportunities for future research. It would be fruitful to pursue further research on the correlation between mechanization and productivity among Zambian smallholder farmers. Also, owing to the choice of the case study methodology, the findings cannot necessarily be generalized. However, this study does provide general guidelines in terms of the benefits as well as pitfalls of offering agricultural finance to smallholder farmers in Zambia. The research could be replicated in other SSA countries.

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