Financing Agricultural Production from a Value Chain Perspective: Recent Evidence from South Africa

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Financing agricultural production from a value chain perspective

Recent evidence from South Africa

Cobus Oberholster, Chris Adendorff and Kobus Jonker

Abstract: *World agriculture, despite numerous supply and demand challenges, has to increase its production capacity significantly to satisfy the increased demand for food. In addition, the sector has a significant developmental role to play. Access to credit is, however, a key enabler in this regard. This paper reports on a country-specific study performed to promote the success of agricultural value chain financing in South Africa, with a specific focus on the financing of agricultural production. The literature review provides a global overview of agricultural production, agricultural value chain financing and the potential role of leading chain actors as connecting institutions. The empirical study provides strong evidence of significant relationships between the dependent variable of the study, namely the perceived success of agricultural value chain financing in South Africa, and the intervening and independent variables. The independent variables value chain integration, strategic partnering, risk management, supporting services, sustainable production, product range and external financing positively influence the intervening variable – value chain competitiveness. In the same manner, the intervening variable of value chain competitiveness positively influences the perceived success of agricultural value chain financing in this study.*

Keywords: *agricultural production; value chain competitiveness; agricultural value chain financing*

Cobus Oberholster (corresponding author) is with BKB AgriFin, PO Box 2002, North End, Port Elizabeth 6056, South Africa. E-mail: cobus.oberholster@bkb.co.za. Chris Adendorff and Kobus Jonker are with Nelson Mandela Metropolitan University Business School, Port Elizabeth, South Africa.

Increased levels of investment and access to financial services are key determinants of agricultural productivity growth (FAO, 2012). The availability of banking and credit facilities not only reinforces the demand for and supply of farm inputs and advisory services (Nascimento, 2013), but also, according to the United Nations Development Programme (UNDP, 2012), contributes to agricultural growth through promoting entrepreneurship, innovation and technology adoption. While there has been much research on agricultural financing and the potential developmental role of the sector, country-specific studies which take into account the multidimensional nature of agricultural production in South Africa are limited. In addition, agricultural value chain finance and the beneficial role that multiple stakeholders may play in improving access to credit remain a concept yet to be studied within the context of the South African agricultural sector. This study addresses this limitation by identifying those factors that may influence the effectiveness of agricultural value chain financing models within the South African

context. A theoretical model exploring the relationship between the proposed independent and intervening variables, and the perceived success of agricultural value chain financing in South Africa, is proposed and empirically tested.

Agricultural production

The nature of agricultural production systems has a profound influence on the level of complexity and risk relating to financing activities in the sector. Agricultural production systems are driven by unpredictable external factors such as unfavourable weather conditions (Hardaker *et al*, 1998), with agricultural markets that are more volatile than other types of markets because of the low elasticity of supply and demand and the length of time it takes to increase production (McMahon, 2012). The sector is further characterized by raw materials that are usually perishable, variable in quality and not regularly available throughout the year (Konig *et al*, 2013). Agriculture also has a lengthy production cycle, which often leads to less frequent, seasonal payments of loans, with the financial performance of farmers that can be highly correlated, especially for farmers in the same geographic region (Katchova and Barry, 2005). Many of these risks are unpredictable (Hardaker *et al*, 1998) and in certain cases uninsurable (Iturrioz, 2009). Therefore these risks must be dealt with effectively, as they have the potential to create the perception amongst financiers that agricultural production is too risky.

Agricultural financing

The agricultural sector is in need of new and innovative solutions that are commercially viable. Currently the level of commercial bank lending is low; in Sub-Saharan Africa (SSA) it is as low as 10% (Liu *et al*, 2013). This lack of penetration of commercial bank lending, especially in developing countries, is, according to Meyer (2011) and Konig *et al* (2013), due to a number of structural factors, many of which relate to the fact that agricultural production takes place in dispersed geographical areas where bank infrastructure is typically poor. As a result, transaction costs for providing traditional financial services are high, and the lack of financing products tailored to the specific risks and cash flow patterns of agricultural enterprises is also highlighted as a key constraint. It is thus evident that financing solutions for the agricultural sector must be very specific in terms of their end-use, with Asen *et al* (2011) highlighting the necessity for more than one role player being needed to address the full financing needs of the agricultural sector.

Agricultural value chain financing

The development of integrated value chains is recommended by the Food and Agriculture Organization (FAO, 2012) as an effective approach to secure the income of agricultural producers and their access to financing through value chain linkages. Such an approach can play a significant role in linking agricultural producers to markets, which is especially beneficial to small-scale producers. The key role of direct business relationships, and the level of sustainability that these market relationships provide, is also highlighted by the World Council of Credit Unions (2009). Successful agricultural value chains are characterized by the use of financial products that meet specific needs, with credit risk that is significantly reduced by the techniques used to disburse and collect funds. Repayment options, according to Stone *et al* (2012), are in many cases also embedded in non-financial relationships within value chains, which makes it relatively easy for lenders to enforce credit contracts. Vorley (2001) argued that the linking of finance to other activities in the value chain had the ability to make a significant contribution in convincing formal financial institutions to move away from the current approach of mainly relying on land as collateral – which is, according to FAO (2012), a key factor in enabling small-scale producers to secure funds that would otherwise not be available through conventional financing institutions.

The role of connecting institutions

As food systems are increasingly linked from producer to consumer, many interdependent business relationships have developed between producers and the various role players within agricultural value chains. Given this level of interdependency or mutual dependencies, these relationships can, according to Sudha and Kruijssen (2011), be described as strategic partnerships. A key aspect of these is the increasingly dominant role that is played by agro-industry firms and retailers (Raymond, 2012). According to Greenberg (2010), these secondary agribusinesses are dominant role players with a growing concentration of control in the agricultural sector, and are ideally positioned to assist commercial banks in reducing cost and risk. Many of these agribusinesses have an extended rural footprint which allows for a hands-on approach with regard to the management of credit risks. They also have intimate knowledge of their customer base through their status as preferred service providers in agricultural value chains, plus access to markets that has significant advantages, especially for small-scale farmers (Smale and Mahoney, 2010).

Problem statement

As state-run, donor-driven models of agricultural financing have proved to have the lowest financial sustainability (Kibaara and Nyoro, 2007), it is critical that private sector financial institutions develop sufficient appetite levels to invest in agriculture and increase the level of agricultural financing. However, as a result of the multidimensional and complex nature of agricultural production systems, financial services providers in South Africa face the challenge of identifying the factors that influence the success of new and innovative financing solutions for agricultural producers. Against this background, the main research problem investigated in this study was to identify the factors that influence the success of new and innovative financing solutions for agricultural producers.

Research objectives

The primary objective of the study was therefore to identify the factors that would promote the success of new and innovative financing solutions for agricultural

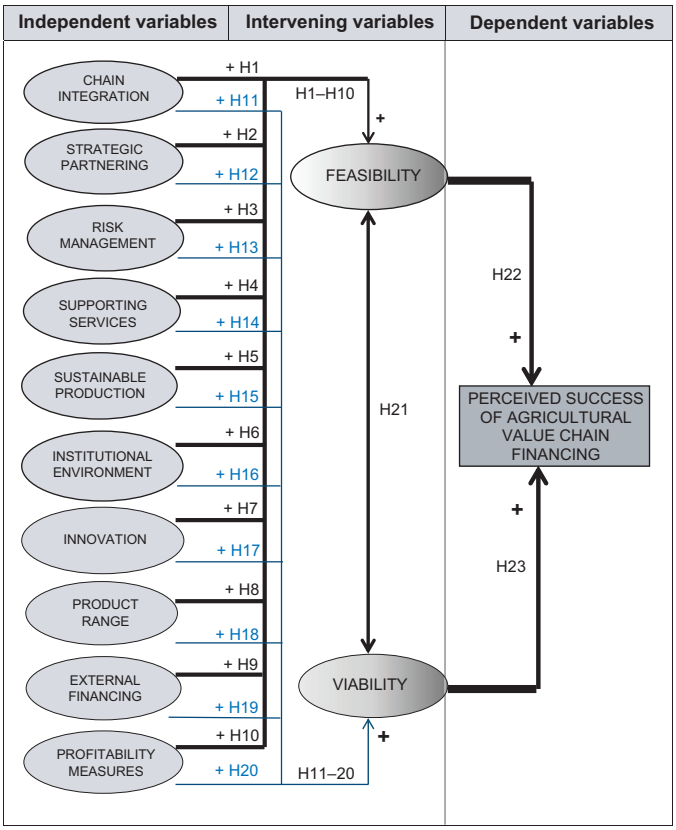

Figure 1. Theoretical model of perceived success of agricultural value chain financing.

production, and subsequently the development of a theoretical financing model for agricultural production in South Africa. The research objectives were to construct a theoretical model and empirically test it and the suggested hypotheses by means of sourcing data from the relevant role players in the agricultural sector in South Africa.

Conceptual model

A literature review was used to develop a conceptual theoretical model to influence the success of agricultural value chain financing in South Africa. The proposed theoretical model is illustrated in Figure 1, and was empirically tested using the technique of structural equation modelling (SEM) for the assessment of the hypothesized relationships (H^1–H^{23}). In the theoretical model, the perceived success of agricultural value chain financing is the dependent variable. The proposed theoretical model (Figure 1) illustrates how the independent variables are expected to interrelate with the intervening variables and how these are expected to interrelate with the dependent variable.

Operationalization of the variables

The dependent variable: perceived success of agricultural value chain finance. In this study, the perceived success of agricultural value chain financing is defined as the degree to which the proposed value chain financing model resulted in an increased flow of financing to agricultural producers, a notable growth in agricultural production as a result of the increased flow, and an increased level of global competitiveness of the sector, which ultimately resulted in an increased ability of the sector to satisfy the increased demand for food and reduce hunger and poverty, especially in rural areas.

Intervening variable: feasibility. For agricultural value chain financing to be feasible over the long term, it has to contribute on a multidimensional level, which includes the economic, social, environmental and political dimensions (Reardon and Timmer, 2012). Here, 'feasibility study' refers to the identification of opportunities and threats and the potential impact on the success of the proposed agricultural value chain financing model as presented by the multidimensionality of agricultural production (economically, productively, socially and ecologically), which also required that the interdependence of diverse environments and local communities should be acknowledged. It was therefore hypothesized that:

> *H^{21}:* There is a positive relationship between the feasibility and viability of South African agricultural value chain financing models.
> *H^{22}:* There is a positive relationship between feasibility and the perceived success of agricultural value chain financing in South Africa.

Intervening variable: viability. A viability study is an in-depth investigation of the profitability of a business idea (Nieuwenhuizen *et al*, 2004). According to Nieuwenhuizen *et al* (2004), for an idea to be a viable business idea, it must also be marketable, and the business must be manageable and viable at a sustainable point. In this study, 'viability study' refers to an in-depth assessment of the level of profitability and financial sustainability of the proposed value chain financing model as influenced by the specific financing needs of agricultural producers, the acceptance of the value chain framework by all role players and the ease of implementation of such models. It was therefore hypothesized that:

> *H^{23}:* There is a positive relationship between viability and the perceived success of agricultural value chain financing in South Africa.

Independent variable 1: value chain integration. A key benefit of value chain developments is that they have the ability to link farm-level production effectively to regional and global markets (Singh, 2011). Modern value chains are characterized by increased levels of chain coordination and integration, which, according to Thangata *et al* (2011), ultimately allows producers to share in higher-value markets. The interdependent business relationships which develop as a result of increased levels of chain integration ultimately have the ability to improve the creditworthiness of agricultural producers (Sudha and Kruijssen, 2011). It was therefore hypothesized that:

> *H^1:* There is a positive relationship between the level of value chain integration and feasibility of South African agricultural value chain financing models.
> *H^{11}:* There is a positive relationship between the level of value chain integration and viability of South African agricultural value chain financing models.

Independent variable 2: strategic partnering. From an operational and credit risk perspective, specialized, non-financial chain actors are ideal strategic partners for financial institutions that want to broaden the distribution of financing services to agricultural producers (Gowa, 2013). Various examples are presented in the literature of how strategic partnerships with these non-financial chain actors have resulted in an increased flow of financing to agricultural producers, with various authors such as Asen *et al* (2011) highlighting strategic partnering as an excellent means of addressing the reluctance of financial institutions to go into rural areas and reach more unbanked customers. It was therefore hypothesized that:

H[2]*:* There is a positive relationship between the development of strategic partnerships between financial institutions and leading chain actors and the feasibility of South African agricultural value chain financing models.
H[12]*:* There is a positive relationship between the development of strategic partnerships between financial institutions and leading chain actors and the viability of South African agricultural value chain financing models.

Independent variable 3: risk management. Secondary agribusinesses are ideally suited to assist producers in managing risk. Their role in risk management models that have the ability to reach large numbers of rurally based small-scale producers is widely acknowledged, with authors such as Konig *et al* (2013) and Nascimento (2013) describing their role as essential for driving further development of the agricultural sector. It was therefore hypothesized that:

H[3]*:* There is a positive relationship between the use of risk management measures by key chain actors and the feasibility of South African agricultural value chain financing models.
H[13]*:* There is a positive relationship between the use of risk management measures by key chain actors and the viability of South African agricultural value chain financing models.

Independent variable 4: supporting services. Agricultural producers need a range of sector-specific supporting services which include technical expertise, reliable market information and ongoing access to production inputs. As a result of the declining role and capacity of the state, the competitiveness of agricultural producers is currently limited by restricted access to these types of supporting services (McMahon, 2012), which according to Konig *et al* (2013) is especially relevant with regard to small-scale producers. It was therefore hypothesized that:

H[4]*:* There is a positive relationship between the provision of supporting services to agricultural producers and the feasibility of South African agricultural value chain financing models.
H[14]*:* There is a positive relationship between the provision of supporting services to agricultural producers and the viability of South African agricultural value chain financing models.

Independent variable 5: sustainable production. For the agricultural sector to sustain food production at increased levels it is important to adopt productive, competitive and efficient practices, while protecting and improving the environment and the global ecosystem as well as the socioeconomic conditions of local communities (which include the agricultural producer) in line with human dignity (Häni, 2006). It was therefore hypothesized that:

H[5]*:* There is a positive relationship between the execution of sustainable agricultural production practices and the feasibility of South African agricultural value chain financing models.
H[15]*:* There is a positive relationship between the execution of sustainable agricultural production practices and the viability of South African agricultural value chain financing models.

Independent variable 6: institutional environment. It is widely accepted that investment in general is a market-based approach, with the role of government being to create the legal, policy and institutional environment that enables private sector investors to respond to market opportunities (Nascimento, 2013). Various authors such as Larsen *et al* (2009) therefore argued that it was government's responsibility to build the institutional capacity to facilitate access to financing for agricultural producers. It was therefore hypothesized that:

H[6]*:* There is a positive relationship between an institutional environment that is conducive to agricultural investment and the feasibility of South African agricultural value chain financing models.
H[16]*:* There is a positive relationship between an institutional environment that is conducive to agricultural investment and the viability of South African agricultural value chain financing models.

Independent variable 7: innovation. As a result of the increased levels of complexity there is strong evidence against a blanket approach to agricultural financing, with a clear need for innovative financing solutions that could be leveraged to mitigate risk and support sector growth (Jouili, 2011; Mustafa *et al*, 2011). It was therefore hypothesized that:

H[7]*:* There is a positive relationship between the innovative use of available products, processes, services, technologies and ideas and the feasibility of South African agricultural value chain financing models.
H[17]*:* There is a positive relationship between the innovative use of available products, processes, services, technologies and ideas and the viability of South African agricultural value chain financing models.

Independent variable 8: product range. The lack of penetration of commercial bank lending, especially in developing countries, is due to an array of structural factors, which according to Konig *et al* (2013) include a lack of financing products tailored to the specific risks and cash flow patterns of agricultural enterprises. Financing needs do change with financial, economic and institutional developments (Miller and Jones, 2010), which highlights the need for financing products that do not

disregard important sector- and country-specific factors. It was therefore hypothesized that:

H[8]: There is a positive relationship between the offering of an appropriate product range that satisfies the country-specific needs of agricultural producers and the feasibility of South African agricultural value chain financing models.
H[18]: There is a positive relationship between the offering of an appropriate product range that satisfies the country-specific needs of agricultural producers and the viability of South African agricultural value chain financing models.

Independent variable 9: external financing. Although downstream companies such as secondary agribusinesses are already playing a notable role in agricultural lending, the level of financing is limited to the amount that these agribusinesses can borrow on the strength of their own underlying financial position (Miller and Jones, 2010). Various authors such as Coon *et al* (2010) therefore argued that value chain financing was generally most developed when there were successful linkages to external finance, usually from formal financial institutions. It was therefore hypothesized that:

H[9]: There is a positive relationship between the level of external finance to a particular agricultural value chain and the feasibility of South African agricultural value chain financing models.
H[19]: There is a positive relationship between the level of external finance to a particular agricultural value chain and the viability of South African agricultural value chain financing models.

Independent variable 10: profitability measures. From the literature it is evident that the delivery of financial services to a geographically dispersed client base in rural areas poses challenges to the banking sector, which according to Bosc *et al* (2012) is mainly centred around perceived higher risks and high transaction costs that arise due to the establishment of extended branch networks and financial infrastructure. Value chain integration can improve the creditworthiness of agricultural producers and ultimately reduce bad debts (Sudha and Kruijssen, 2011). Agricultural value chain finance also offers an opportunity to formal financial institutions to reduce transaction costs (Vasilescu and Popa, 2008) and to widen their respective product offerings (Mustafa *et al*, 2011). Both these factors directly impact on the profitability of financial institutions. It was therefore hypothesized that:

H[10]: There is a positive relationship between the extent of profitability measures from the standpoint of financial institutions and the feasibility of South African agricultural value chain financing models.
H[20]: There is a positive relationship between the extent of profitability measures from the standpoint of financial institutions and the viability of South African agricultural value chain financing models.

Methodology

Based on the literature, a structured questionnaire was developed to source the primary data to test the hypothesized relationships represented in the conceptual model, and consequently to identify the factors influencing the perceived success of agricultural value chain financing in South Africa. The questionnaire consisted of 70 statements or items linked to the variables that influence the success of agricultural value chain financing. A 7-point Likert-type interval scale was used and respondents were requested to indicate the extent of their agreement or disagreement with regard to each statement, which ranged from 1 (strongly disagree) to 7 (strongly agree).

Exploratory factor analysis (EFA) was conducted to assess the discriminant validity of the research instrument and to confirm whether or not the data contained the underlying dimensions of the perceived success of agricultural value chain financing, as proposed in the theoretical model. After the reliability of the measuring instrument was confirmed, the conceptual model was subjected to statistical testing. Structural equation modelling (SEM) was adopted to test the network of relationships between the set of factors identified. It was chosen as it is appropriate for theory testing and incorporates multiple independent and dependent variables as well as the hypothetical latent constructs that clusters of observed variables might represent (Savalei and Bentler, 2010). The software application LISREL (v 8.8) was used to test the relationships among the factors that influence the perceived success of agricultural value chain financing in South Africa.

Snowball sampling was applied to this research as it is appropriate when the members of a special population are difficult to locate (Mouton and Babbie, 2001). For this research the population was identified as agricultural producers (users of credit), lending specialists employed by credit providers in the South African agricultural sector and agricultural economists advising the sector. The sample collection for this research consisted of 278 respondents.

Results and discussion

Hair *et al* (2006) proposed a combination of several criteria to determine the number of factors to be extracted. In this study, Eigenvalues, the percentage of variance explained and individual factor loadings were considered to determine the number of factors to be extracted. The Eigenvalues (> 1.0) as presented in Tables 1 and 2

Table 1. Rotated factor loadings: dependent variables.

Item	Factor 1 PERCS	Factor 2 VCCOMP
PERCS2	**0.752**	0.015
FEAS2	**0.706**	0.041
FEAS1	**0.693**	0.045
PERCS6	**0.676**	–0.105
FEAS3	**0.531**	–0.186
PERCS1	**0.486**	–0.034
FEAS5	–0.159	**–0.859**
PERCS5	0.045	**–0.717**
PERCS4	0.199	**–0.574**
PERCS3	0.236	**–0.509**
VIAB4	0.196	**–0.463**
Eigenvalues	5.026	1.197

Table 2. Rotated factor loadings: independent variables.

Item	Factor 1 VALI	2 PRODR	3 RISKM	4 SSERV	5 SUSTP	6 EXTF	7 COMM	8 SPART
EXTF3	**0.761**	0.016	0.205	–0.046	–0.024	0.077	0.133	0.100
VALI3	**0.712**	0.009	0.060	0.209	–0.013	–0.010	0.199	0.058
VALI2	**0.679**	0.061	–0.030	0.333	–0.017	–0.156	0.059	0.061
PRODR3	**0.625**	–0.167	0.016	0.064	0.150	0.018	0.133	0.185
INOV5	**0.608**	0.032	0.180	–0.055	0.215	0.162	–0.225	0.062
PROFM3	**0.601**	–0.066	0.099	0.222	0.090	0.220	0.090	0.018
PRODR4	**0.517**	–0.012	0.372	0.085	0.183	0.063	–0.007	–0.141
INOV4	**0.499**	–0.002	0.342	0.021	0.176	0.067	0.002	–0.386
PROFM4	**0.463**	–0.120	0.189	0.294	0.067	0.389	0.148	–0.112
PRODR1	–0.077	**0.833**	0.023	0.092	0.038	–0.076	0.002	0.021
PRODR2	–0.015	**0.791**	0.042	0.096	0.153	0.086	0.086	0.097
EXTF1	0.017	**0.788**	–0.098	–0.107	0.028	–0.063	0.108	0.084
PRODR5	–0.030	**0.625**	0.072	–0.078	0.041	0.239	–0.030	–0.098
RISKM2	0.145	0.096	**0.737**	0.194	0.002	–0.012	0.028	0.084
RISKM4	0.201	–0.038	**0.735**	0.096	0.015	0.045	0.059	0.140
RISKM3	0.122	0.019	**0.707**	–0.014	0.075	0.193	0.110	0.042
SSERV4	0.122	–0.155	**0.450**	0.165	0.264	0.044	0.343	0.123
SPART1	0.215	–0.108	0.125	**0.712**	0.092	–0.028	–0.137	0.103
RISKM1	–0.004	0.114	0.149	**0.649**	0.225	0.012	–0.001	0.218
VALI1	0.265	0.036	0.073	**0.617**	–0.083	0.075	0.061	–0.231
SSERV1	0.196	–0.033	0.042	**0.522**	0.106	0.114	0.356	0.065
SPART5	0.161	0.286	–0.056	0.007	**0.665**	0.016	–0.147	0.051
SUSTP2	0.073	0.154	0.035	0.126	**0.585**	–0.048	0.066	0.063
INSTE4	–0.047	0.079	0.092	0.271	**0.584**	0.083	–0.138	–0.283
SSERV5	0.076	–0.027	0.182	0.055	**0.492**	0.058	0.337	0.080
SUSTP3	0.149	–0.223	0.050	–0.093	**0.429**	0.054	0.136	0.091
EXTF5	0.079	0.149	–0.006	0.021	–0.039	**0.774**	0.072	0.013
EXTF4	0.114	–0.003	0.207	0.051	0.107	**0.766**	–0.022	0.083
SSERV2	0.257	0.082	0.149	0.134	0.027	–0.169	**0.691**	–0.084
INSTE8	0.036	0.109	0.053	–0.089	0.018	0.166	**0.686**	0.014
SPART2	0.083	0.040	0.191	0.047	0.057	0.046	0.025	**0.789**
SPART4	0.252	0.120	0.255	0.175	0.114	0.089	–0.081	**0.431**
Eigenvalues	6.230	2.838	1.723	1.641	1.490	1.348	1.310	1.144

suggested that two factors should be used as the intervening variables and eight factors as independent variables. All items with loadings of < 0.4 were deleted.

Discriminant and construct validity assessment and reliability assessment

Dependent variables. Two factors with Eigenvalues greater than 1.0 were extracted, namely *value chain competitiveness* (coded VCCOMP) and *perceived success of agricultural value chain financing* (coded PERCS). Table 1 indicates that a total of 11 items loaded on these two distinct factors and this structure explains 56.5% of the variance in the data. The underlined loadings represent significant loadings ($p \geq 0.4$). Sufficient evidence of discriminant validity is therefore provided.
Factor 1: Perceived success of agricultural value chain financing (coded PERCS). The factor *PERCS* was measured by six items, and explains 45.6% of the variance in the data. *PERCS* returned an Eigenvalue of 5.026, as reported in Table 1. The six items measuring *PERCS* returned an acceptable Cronbach-alpha coefficient of 0.827, which indicates that the instrument used to measure this construct is reliable. The items FEAS1, FEAS2 and FEAS3 also loaded with the factor PERCS and were thus regarded as measures of the factor.

Factor 2: Value chain competitiveness (coded VCCOMP). The factor *VCCOMP* was measured by five items, and explains 10.8% of the variance in the data. *VCCOMP* returned an Eigenvalue of 1.197, as reported in Table 1. The five items measuring *VCCOMP* returned an acceptable Cronbach-alpha coefficient of 0.818. The variables *feasibility* and *viability* in the original conceptual model were thus replaced by one intervening variable. Based on the items loaded, it was decided to rename the factor as *value chain competitiveness*. The items PERCS3, PERCS4, PERCS5, FEAS5 and VIAB4 loaded with the new factor VCCOMP and were thus regarded as measures of the latent variable *VCCOMP*. For the purpose of this study, *value chain competitiveness* refers to the degree of success with which agricultural value chains can assist producers to satisfy increased consumer demand on a sustainable basis, and by doing so allow value chains to grow and increase the sector's global competitiveness, and simultaneously present financial services providers with the opportunity to increase the profitability of lending activities to the agricultural sector.

Independent variables. The independent variables, namely *chain integration, strategic partnering, risk management, supporting services, sustainable production, institutional environment, innovation, product range, external financing*

and *profitability measures*, were then assessed for discriminant validity by using the Principal Component extraction method with a Varimax rotation. The results of the factor analysis for the independent variables are reported in Table 2. Eight factors with Eigenvalues greater than 1.0 were extracted, namely *chain integration, strategic partnering, risk management, supporting services, sustainable production, commercial orientation, product range* and *external financing*. Table 2 indicates that a total of 32 items loaded on eight distinct factors, which explain 55.3% of the variance in the data. Sufficient evidence of discriminant validity is therefore provided.

Factor 1: Value chain integration (coded VALI). The factor *VALI* was measured by nine items, and explains 19.46% of the variance in the data. *VALI* returned an Eigenvalue of 6.230 as reported in Table 2. The nine items measuring *VALI* returned an acceptable Cronbach-alpha coefficient of 0.840, which indicates that the instrument used to measure this construct is reliable. The items EXTF3, PRODR3, PRODR4, PROFM3, PROFM4, INOV4 and INOV5 also loaded with the factor VALI and were thus regarded as measures of the variable Value Chain Integration.

Factor 2: Product range (coded PRODR). The factor *PRODR* was measured by four items, and explains 8.86% of the variance in the data. *PRODR* returned an Eigenvalue of 2.838, as reported in Table 2. The four items measuring *PRODR* returned an acceptable Cronbach-alpha coefficient of 0.781. The item EXTF1 also loaded with the factor PRODR and was thus regarded as a measure of the variable *PRODR*.

Factor 3: Risk management (coded RISKM). The factor *RISKM* was measured by four items, and explains 5.38% of the variance in the data. *RISKM* returned an Eigenvalue of 1.723, as reported in Table 2. The four items measuring *RISKM* returned an acceptable Cronbach-alpha coefficient of 0.710. The item SSERV4 also loaded with the factor *RISKM* and was thus regarded as a measure of the variable *RISKM.*

Factor 4: Supporting services (coded SSERV). The factor *SSERV* was measured by four items, and explains 5.12% of the variance in the data. *SSERV* returned an Eigenvalue of 1.641, as reported in Table 2. The four items measuring *SSERV* returned an acceptable Cronbach-alpha coefficient of 0.639. The items SPART1, RISKM1 and VALI1 also loaded with the factor *SSERV* and were thus regarded as measures of the variable *SSERV.*

Factor 5: Sustainable production (coded SUSTP). The factor *SUSTP* was measured by five items, and explains 4.65% of the variance in the data. *SUSTP* returned an Eigenvalue of 1.490, as reported in Table 2. The five items measuring *SUSTP* returned a Cronbach-alpha coefficient of 0.520. Although 0.7 is generally agreed as the lower limit, Hair *et al* (2006) indicated that in exploratory research, Cronbach-alpha coefficients may decrease. The instrument used to measure this construct was therefore accepted as reliable. The items SPART5, INSTE4 and SSERV5 also loaded with the factor *SUSTP* and were thus regarded as measures of the variable *SUSTP.*

Factor 6: External financing (coded EXTF). The factor *EXTF* was measured by two items, and explains 4.21% of the variance in the data. *EXTF* returned an Eigenvalue of 1.348, as reported in Table 2. The two items measuring *EXTF* returned a Cronbach-alpha coefficient of 0.573. As Cronbach-alpha coefficients may decrease in exploratory research (as indicated above), the instrument used to measure this construct was accepted as reliable.

Factor 7: Commercial orientation (coded as COMM). Based on the two items that loaded, namely INSTE8 and SSERV2, Factor 7 was named *commercial orientation* (COMM). The factor *COMM* explains 4.09% of the variance in the data. *COMM* returned an Eigenvalue of 1.310, as reported in Table 2. The two items measuring *COMM* returned a Cronbach-alpha coefficient of 0.435, which indicates relatively low reliability of the instrument. From a management perspective and for reasons of external validity, the factor is nevertheless viewed as important. It was therefore decided to keep the factor in the model. The low value (< 0.5) is, however, acknowledged as a limitation of the study. The items INSTE8 and SSERV2 loaded with the new factor *COMM* and were thus regarded as measures of the latent variable commercial orientation.

Factor 8: Strategic partnering (coded SPART). The factor *SPART* was measured by two items, and explains 3.57% of the variance in the data. *SPART* returned an Eigenvalue of 1.144, as reported in Table 2. The two items measuring *SPART* returned a Cronbach-alpha coefficient of 0.421, which indicates relatively low reliability of the instrument. From a management perspective and for reasons of external validity, the factor is nevertheless viewed as important. It was therefore decided to keep the factor in the model. The low value (< 0.5) is, however, acknowledged as a limitation of the study.

Revised theoretical model

After the above assessment, the independent variables *institutional environment*, *innovation* and *profitability measures* were removed due to inadequate evidence of discriminant validity or reliability. However, a new latent variable termed *commercial orientation* emerged. The

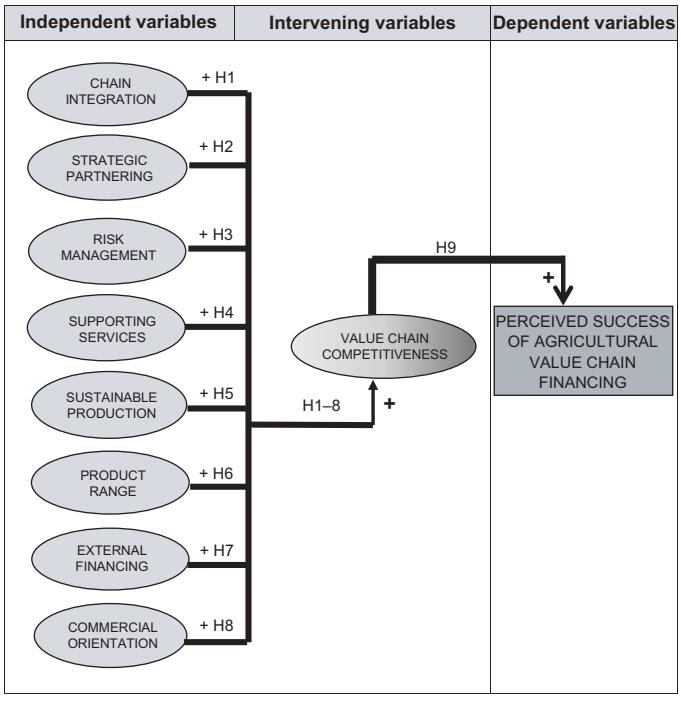

Figure 2. The revised theoretical model.

Table 3. Goodness-of-fit indices for the measurement and structural models.

	Measurement model	Structural model
Sample size	232	229
Degrees of freedom	666	711
Fit function chi-square	1,163.512 (p = 0.0)	1,248.717 (p = 0.0)
Normal theory weighted least square chi-square	1,100.828 (p = 0.0)	1,182.077 (p = 0.0)
Satorra-Bentler scaled chi-square	903.943 (p = 0.0)	971.913 (p = 0.0)
x^2/df (ratio of chi-square to degrees of freedom)	1.357 (norm < 3)	1.366 (norm < 3)
Root Mean Square Error of Approximation (RMSEA)	0.0359	0.0364
p-value for test of close fit (RMSEA < 0.05)	1.00	1.00
Expected cross-validation index (ECVI)	4.086	4.296
90% confidence interval for ECVI	(3.817; 4.385)	(4.015; 4.605)
ECVI for saturated model	5.632	5.921
ECVI for independence model	41.856	42.461
Comparative fit index (CFI)	0.978	0.976

original theoretical model (Figure 1) and the defined hypotheses were revised (Figure 2).

Assessment of goodness of fit

In order to assess the extent to which the proposed model represents an acceptable approximation of the data, the goodness-of-fit indices of the model were assessed. For this, the following hypotheses were formulated:

H^0: The data fit the model perfectly.
H^{1b}: The data do not fit the model perfectly.

The goodness-of-fit indices for both the measurement and structural models are presented in Table 3. Based on the chi-square value, the hypothesis of a perfect fit is rejected and the alternative hypothesis accepted. The Root Mean Square Error of Approximation (RMSEA) value of 0.036 and Comparative Fit Index (CFI) of 0.976 both support the conclusion of a close-fitting model.

Structural and measurement model

Based on an inspection of the factor loadings and the modification indices, it was decided to remove the latent variable *commercial orientation* from the model due to construct validity concerns. The revised model's

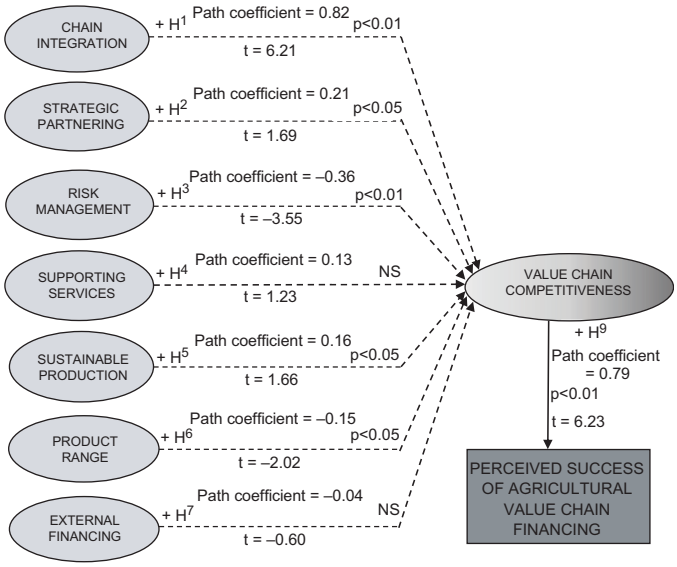

Figure 3. Structural model estimation (including t-values). *Notes:* NS = non-significant. The latent variable *commercial orientation* was reduced from the model due to construct validity concerns. The H^8 hypothesis was subsequently also removed.

Table 4. The revised model's endogenous and predictor variables.

Structural model endogenous variables	Predictor variables
Value chain competitiveness	Value chain integration, product range, risk management, supporting services, sustainable production, external finance, strategic partnering
Perceived success of agricultural value chain financing	Value chain competitiveness
Value chain competitiveness	VIAB4, PERCS4, FEAS5, PERCS5, PERCS3
Value chain integration	VALI2, VALI3, PRODR3, EXTF3, PROFM3, INOV4, PRODR4, PROFM4, INOV5
Product range	PRODR1, EXTF1, PRODR2, PRODR5
Risk management	RISKM2, RISKM3, RISKM4
Supporting services	VALI1, SPART1, RISKM1, SSERV1
Sustainable production	SUSTP2, SUSTP3, INSTE4, SPART5, SSERV5
External finance	EXTF4, EXTF5
Strategic partnering	SPART2, SPART4
Perceived success of agricultural value chain financing	FEAS1, PERCS1, FEAS2, PERCS2, FEAS3, PERCS6

endogenous and predictor variables (excluding the deleted variable *commercial orientation*) were used as inputs for the LISREL software application (Table 4). The structural model estimation and the results from LISREL are shown in Figure 3. The reported path coefficients indicate the loading of the manifest variable on the latent construct. No changes were made to the measurement model. The process of model estimation also includes a t-value, which, according to Cooper and Schindler (2007), is used to determine the statistical significance between a sample distribution mean and a parameter. The t-values with regard to the revised model are shown in Figure 3. All hypotheses are directional hypotheses, with a t-value of ≥ 1.64 for the one-tailed test that will represent a $p < 0.05$, and indicate the minimum acceptable value for hypothesis acceptance.

Significant relationships identified by SEM

Chain integration

The results (Figure 3) indicate that there is a positive relationship (point estimate 0.82; t-value = 6.21; $p < 0.01$) between the level of *value chain integration* and *agricultural value chain competitiveness*. The hypothesis H^1 is accepted. The results suggest that the integration of agricultural producers, through the development of interdependent business relationships between producers and other value chain actors, will increase the flow of finance and by doing so improve the competitiveness of agricultural value chains.

Strategic partnering

The results indicate that there is a positive relationship (point estimate 0.21; t-value = 1.69; $p < 0.05$) between *strategic partnering* and *agricultural value chain competitiveness* (one-tailed). The hypothesis H^2 is accepted. The results suggest that the development of strategic partnerships between financial institutions and leading value chain actors will allow financial institutions to increase the flow of finance to the agricultural sector and by doing so improve the competitiveness of agricultural value chains.

Risk management

The results indicate that there is a statistically significant relationship (point estimate –0.36; t-value = –3.55; $p < 0.01$) between *risk management* measures and *agricultural value chain competitiveness*. The relationship is, however, negative and the hypothesis H^3 is rejected. The results thus suggest that agricultural producers do not have the ability to manage effectively all aspects of risk in the agricultural sector themselves, and highlight the need for the provision of risk management measures by external parties such as secondary agribusinesses. The provision of risk management measures by external parties is therefore confirmed as a factor influencing value chain competitiveness and ultimately the perceived success of agricultural value chain financing.

Supporting services

The results indicate that there is a positive relationship (point estimate 0.13; t-value = 1.23) between the provision of *supporting services* and *agricultural value chain competitiveness*, but that the minimum acceptable value for hypothesis acceptance is not reached. The hypothesis H^4 is rejected at the 5% level of significance, although it approaches significance. The empirical relationship is, however, in the expected direction (positive), which suggests that the provision of supporting services will allow agricultural producers to increase the level of agricultural production, and by doing so improve the competitiveness of agricultural value chains.

Sustainable production

The results indicate that there is a positive relationship (point estimate 0.16; t-value = 1.66; $p < 0.05$) between the execution of *sustainable agricultural production* practices and *agricultural value chain competitiveness* (one-tailed). The hypothesis H^5 is accepted. The results suggest that the agricultural sector has the ability to increase agricultural production over the long term on an economically viable basis, while still acknowledging the interdependence of diverse environments (including the natural environment) and local communities.

Product range

The results indicate that there is a statistically significant relationship (point estimate –0.15; t-value = –2.02; $p < 0.05$) between the offering of an appropriate *product range* of financing products and *agricultural value chain competitiveness*. The relationship is, however, negative and the hypothesis H^6 is rejected. The negative relationship, however, suggests that the existing range of financing products is not sufficient to satisfy the sector-specific financing needs of all agricultural producers in South Africa. The literature also provides strong evidence of opportunities that are offered by agricultural value chains in this regard. The unavailability of an appropriate range of financing products is therefore confirmed as a factor influencing value chain competitiveness and ultimately the perceived success of agricultural value chain financing in South Africa.

External financing

The results indicate that in the South African context there is no relationship (point estimate –0.04; t-value = –0.60) between the level of *external financing* to a particular agricultural value chain and *agricultural value chain competitiveness*. The hypothesis H^7 must thus be rejected from a statistical point of view. The beneficial role that multiple stakeholders may play in improving access to credit, however, remains a concept yet to be studied in the context of the South African agricultural sector – which may explain this unexpected result. The literature, however, highlighted the key role that leading chain actors or secondary agribusinesses can play in facilitating increasing financing levels to the sector. Evidence is also provided of the growing lending role that secondary agribusinesses in South Africa have already started to play, which is, however, funded by their own capital and which has proved to be too limited in scope. Further evidence is provided of the much needed growth strategies with regard to these agribusinesses (of which mergers and acquisitions form a key element), with the use of their

Table 5. Summary of hypotheses tested in the revised model.

Hypothesis	Decision
H[1] There is a positive relationship between the level of *value chain integration* and *agricultural value chain competitiveness* in South Africa	Supported
H[2] There is a positive relationship between the development of *strategic partnerships* between financial institutions and leading chain actors and *agricultural value chain competitiveness* in South Africa	Supported
H[3] There is a positive relationship between the use of *risk management* measures by key chain actors and *agricultural value chain competitiveness* in South Africa	Rejected
H[4] There is a positive relationship between the provision of *supporting services* to agricultural producers and *agricultural value chain competitiveness* in South Africa	Rejected (but approaching significance)
H[5] There is a positive relationship between the execution of *sustainable agricultural production* practices and *agricultural value chain competitiveness* in South Africa	Supported
H[6] There is a positive relationship between the offering of an appropriate *product range* that satisfies the country-specific financing needs of agricultural producers and *agricultural value chain competitiveness* in South Africa	Rejected
H[7] There is a positive relationship between the level of *external finance* to a particular agricultural value chain and *agricultural value chain competitiveness* in South Africa	Rejected
H[8] There is a positive relationship between the level of *commercial orientation* of agricultural producers and *agricultural value chain competitiveness* in South Africa	Removed from the model
H[9] There is a positive relationship between *value chain competitiveness* and the *perceived success of agricultural value chain financing* in South Africa	Supported

own capital and a corresponding increased borrowing level that may negatively influence their ability to fund these growth strategies. It is therefore expected that increased levels of external finance to chain producers will free up capital for secondary agribusinesses to grow agricultural value chains and subsequently improve their competitiveness.

Value chain competitiveness and the success of agricultural value chain financing

The results indicate that there is a positive relationship (point estimate 0.79; t-value = 6.23; $p < 0.01$) between the level of *value chain competitiveness* and the *perceived success of agricultural value chain financing*. The hypothesis H[9] is accepted. The results suggest that increased levels of value chain competitiveness will not only assist producers to satisfy increased consumer demand on a sustainable basis, but also present financial service providers with the opportunity to increase financing levels to the agricultural sector.

A summary of the hypotheses is presented in Table 5. New ground has been broken by this study in that it provides evidence that integrated agricultural value chains present financial services providers in South Africa with the opportunity to reduce cost and risk in agricultural financing, and simultaneously contribute to the successful integration of agricultural producers into modern value chains. Both validity and reliability were assessed and resulted in eight factors, *value chain integration, strategic partnering, risk management, supporting services, sustainable production, product range, external financing* and *value chain competitiveness*, which potentially influence the dependent variable of *perceived success of agricultural value chain financing* in South Africa. The contribution of agricultural value chains is graphically presented in Figure 4. The illustration shows how the flow

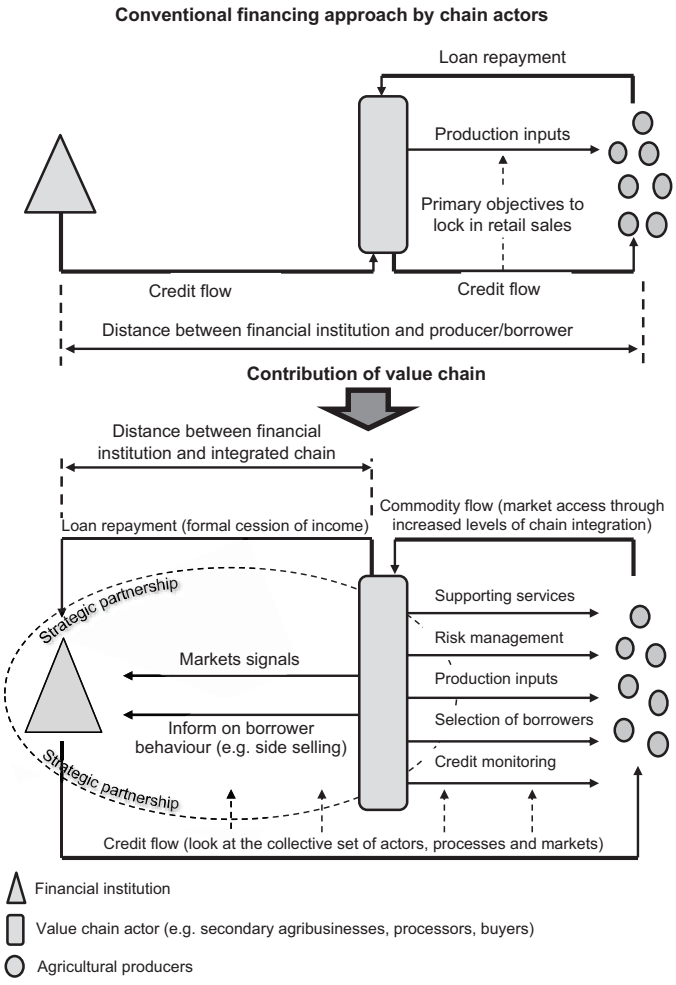

Figure 4. The contribution of a value chain approach.
Source: Authors' own construction (2014).

of credit changes with the proposed value chain financing model, as well as the key role of the chain actor or secondary agribusiness. It also shows how the distance between the financial institution and the borrower can be shortened through strategic partnerships between financial institutions and value chain actors within a specific agricultural value chain.

Summary

Although supported by the literature, statistically non-significant relationships between *supporting services* and *agricultural value chain competitiveness* and *external financing* and *agricultural value chain competitiveness* also emerged from the empirical results. These unexpected results may be explained by the limited research on the beneficial role that multiple stakeholders (including those external to agricultural value chains) may play in improving access to credit, specifically in the context of the South African agricultural sector. The two factors, as well as the beneficial role of multiple stakeholder involvement, warrant further research.

In summary, the research provides a basis on which industry role players and financiers can identify key factors that influence the success of new and innovative financing solutions to the sector, with the constructed model that can serve as a valuable guideline in this regard. Given the transformative ability of agricultural growth, the model can serve as a powerful mechanism to address the historical negative impact of apartheid in South Africa and the current overreliance and pressure on the commercial agriculture sector for food security. The concept of value chains therefore also provides a development framework which has the ability to establish a reconnection between financial institutions and small-scale agricultural producers.

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