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DEVELOPING INCLUSIVE MODELS OF VALUE CHAIN FINANCING

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Abstract:

This paper presents a framework for designing external financial intervention mechanisms in the form of partnership agreements between financial institutions and different economic participants involved in the farm machinery supply chain. The scope of these partnership agreements is to facilitate small farmers' access to loans when purchasing agricultural equipment. The research methodology and research results are drawn from desk and field research conducted on the emerging agricultural market. Several inclusive conceptual models of financing mechanisms based on business relationships between financial institutions, small farmers and either the suppliers of agricultural equipment or buyers of agricultural outputs are presented.

Key words: *agricultural machinery supply chain; financial institutions; partnership agreements; value chain financing*

1. Introduction

The agricultural value chain concept refers to integrating various players (private and public) as well as the series of value-added activities, in agriculture production, processing, and marketing, on the way of transporting a product from the factory to the end-user (Miller & da Silva, 2007).

For a financial institution (FI) providing services to the agricultural market, it is vital to know how a specific value chain works for two main reasons: 1) to assess the risks related to each participant and the risks that may affect all the participants of a value chain at the same time and 2) to understand current flows of products and money (sales/purchases/ credit/ advances, etc.), in order: to propose customers suitable financial and non-financial products; to design adequate methodologies to serve the clients; to use some partners to approach the others with a consequence in costs reduction; to develop more secured or risk-sharing financing schemes involving several players of the value chain.

The flows of funds between various links within a value chain comprise what is known as value chain finance (Miller & Jones, 2010). It encompasses all financial services - products and support services - that flow to and/or through a value chain to address the needs and constraints of those involved in the chain who require financing, sales protection, product procurement, risk mitigation and chain efficiency improvement (Miller,

2012). The forms of finance that are developing along the agricultural value chains can be (Miller & Jones, 2010):

- Internal, when they occur within the value chain, such as when an equipment or input supplier provides credit to a farmer or when a buyer (collector, processing company, etc.) advances funds to a farmer or other market intermediary.
- External, when a partnership mechanism is developed with the support of a FI, for instance, a bank or a microfinance institution issues a loan to farmers based on a contract with a trusted supplier/buyer or a warehouse receipt from a recognized storage facility.

Internal value chain financing models bring advantages and disadvantages for both the farmers and the suppliers / buyers. For the farmers, the primary benefits (compared with a loan from a FI) are reduced transaction costs, usually no collateral, less paperwork and technical advice from the commercial lender. The main disadvantage is the fact that the farmer is tied to one particular supplier / buyer and cannot take advantage of lower prices in the market. For the suppliers / buyers, internal credit models can be seen as critical marketing tool, making the equipment or inputs more attractive for sale. But it also brings inconveniences: it drains the business's cash flow and there are risks of non-payment associated (collection and account management can be difficult). Within this context of existing easy-to-implement internal financing schemes through the agricultural value chain, the design of external financing options is not a straightforward process for a FI. Due to the complex nature of agricultural value chain financing, it is critical to thoroughly analyze and comprehend each value chain in its faces before proposing various collaborative ideas between all potential parties (Miller & Jones, 2010).

The current paper presents a framework for designing external financial partnership agreements between a FI and different participants along the farm machinery supply chain, in order to facilitate small farmers' access to loans when purchasing agricultural equipment. The article consists of three parts. The theoretical part presents literature review of the various methodologies applied in agriculture value chain finance with the goal of identifying knowledge gaps in FIs' practices in devising strategies to establish and implement value chain financing mechanisms. The research methodology and research results are drawn from desk and field research conducted by the author on the emerging market, in 2019. Based on the results of this study, some generalized value chain financial models applicable to any FI are then presented in discussion and conclusion sections.

2. Literature Review

The need to develop sustainable agricultural value chain financing mechanisms has become more and more important over the last years. The converging climate conditions, biodiversity, public health and hunger crisis highlight the need for more regenerative food systems. One element impeding the development of regenerative food systems is a scarcity of financial resources, with the central part of the food value chain suffering from significant underfunding (Ho, et al., 2018), (Chen, et al., 2015). Things become more complicated when the concepts of inclusive finance and green finance come

into play (Prazeres, et al., 2022), (Herui, et al., 2020). According to Asikin, Baker, Villano and Daryanto (2020), business models that incorporate a high degree of innovation, market orientation, and crop-livestock integration are predicted to be very profitable and they should rely on three pillars: value proposition, value architecture and financing mechanism (Asikin, et al., 2020). Within this context, there has been an increasing interest in studying and developing practical instruments to link and improve the consumer experience and agricultural production. Initially, ag-value chain studies were considered management studies, but a new perspective has emerged in the last three decades, linked with International Development and Development Economics. As a result, not only sociologists and economists but also international organizations (e.g., Food and Agriculture Organization, International Fund for Agricultural Development and Non-Governmental Organizations) have used value-chain theory in their research and analysis to design methodologies and tools to be further implemented in projects and intervention policies at the level of firms, industries, and countries (Gereffi, 1999), (Gereffi & Fernandez-Stark, 2016), (Gibbon, et al., 2008), (Fonseca, et al., 2019).

Based on a literature review in SCOPUS, PROQUEST, EBSCO, and JSTOR databases, Mac Clay and Feeney (2019) identified 19 papers considered relevant in the notion of “agribusiness value chain methodologies.” These papers define six different approaches in value chain analysis to get the ‘big picture’ on how a specific value chain works (Clay & Feeney, 2019): 1) the strategic approach, which emphasizes the idea of the value chain as a complete economic unit composed of a particular number of players, financial and physical flows, and a customer at the end of the chain whose expectations for the final product should take precedence; 2) the efficiency approach, which is more focused on technical aspects, attempting to understand how to improve processes throughout the value chain; 3) the sustainability approach, more concerned with the impact of products on people's health and the environment; 4) the value assessment approach, more concerned with the amount of value created by each participant and its distribution; 5) the governance strategy, critical in determining how power dynamics inside chains occur, as well as who defines the game rules and 6) the method to development that is frequently adopted by international cooperation organizations and is centered on enhancing the agricultural environment in low-income nations. This last perspective strives to develop and execute solutions that enable agricultural value networks to operate as business units, by strengthening participants (including FIs) and connections within value chains.

Ag-value chain finance methods have progressively arisen as a result of the need to understand how a value chain is built, as well as how its performance may be assessed and monitored through financial mechanisms to integrate financial flows with product and information and knowledge flows, in order to optimize the working and investment capital in the value chain (Stephens, 2021). Literature reveals different inclusive financial instruments that are applied by agricultural value chain finance providers, which must be adapted to the specific local conditions and financial needs of the borrowers (Table 1).

Table 1. Inclusive agricultural value chain financial instruments

Value chain financial instrument	Literature source	Knowledge gap
Product financing (input supplier credit, trader credit/contract farming, marketing company credit, lead firm financing)	(Chen, et al., 2015), (Pham, et al., 2021), (Wang, et al., 2021), (Desclee, et al., 2021), (Oberholster, et al., 2015) (Hartmann, et al., 2020), , (Onyiriuba, et al., 2020), (Branca, et al., 2021), (Ataei, et al., 2020).	- Existing literature on agricultural value chain finance mainly focuses on the internal agriculture value chain finance mechanisms - The step-by-step process of setting up the agricultural value chain financial intervention mechanisms is not practically described in existing literature (a development strategy is useful to practitioners in the field of microfinance). - The primary focus of the majority of the studies are technical constructs of the agricultural value chains and not development of strategies on how to enhance access to inclusive finance via value chain mechanisms - Lack of studies on financial mechanisms related to agricultural machinery supply chain

In conclusion, the literature review reflected the fact that the study of agricultural value chains and agricultural value chain financing are gaining ground among policymakers, civil society organizations, financial donors and financial institutions. The financial instruments associated with value chains have been widely recommended as reliable methods of providing credit to the agricultural sector (Kisakye, 2019), (Njobe & Kaaria, 2015), (Zander, 2015) due to their ability to mitigate credit risk for lenders, reduce borrowing costs and overcome the challenge of lack of collateral among farmers, coupled with the fact that they can make agriculture a viable activity (Ahabyoona & Lubega, 2018). The concepts have considerable potential to improve small farmers access to markets and financial resources, reduce transaction costs, mitigate supply and market risks (Mani & Joshi, 2017). The instruments are deployed on a standalone basis or in combination, their application depending on the nature and context of a value chain and those involved in it (Miller, 2012).

On the other hand, the concept of agricultural value chain finance is scarcely found within the academic sector and the application of the agricultural value chain finance instruments is largely new and unfamiliar for both financial service providers and borrowers (Enotu, et al., 2015). This has sometimes created a restrained attitude towards agriculture finance among lenders (Orwothwun & Qutieshat, 2022). Therefore, to frame and assess value chain models to implement financial intervention mechanisms, practical case studies and empirical evidence from different programs and development projects of national and international organizations are very useful for both researchers and practitioners in the field. The current paper supports these conclusions, bringing additional value to these knowledge gaps arising from the literature review, based on a real case study showing the process of designing an agricultural value chain financial intervention mechanism.

3. Materials and Methods

This study is part of a project commissioned by a local FI and it was financed by an international donor. For the purpose of confidentiality, the name of the FI and the international donor will not be mentioned in this paper; instead, the name “the local FI” and “the donor” will be used. At the same time, no equipment brand name will be mentioned, using abbreviations instead.

In 2019, a local FI was selected by the donor with the scope to enhance small farmers’ access to loans when purchasing agricultural technologies. Under the technical assistance component of the project, the local FI was offered the necessary know-how on how to develop and implement a B2B strategy (how to approach potential partners along the ag-machinery value chains and how to further manage ongoing partnerships). A project team was set up consisting of an international consultant plus staff from the local FI. The project team worked both remote (online meetings) and onsite (field missions) to fulfil the project objectives.

In order to develop a comprehensive understanding of the investigated phenomena and to validate research findings, the triangulation rule was applied. The entire project missions program included: working sessions with representatives of the donor; intensive desk research (PESTEL analysis from secondary data to analyze and monitor the factors that have an impact on the agricultural equipment value chain and to identify potential risks and opportunities); the study of FI’s internal documents and working sessions with FI’s top management (head-quarter credit department and operations department), middle management (district managers and branch managers) and credit officers; ad-hoc visits in different local financial institutions and analysis of information posted on their website and promotional materials; field interviews with economic agents (farmers and vendors) along the ag-machinery value chain, to assess vertical and horizontal relationships, linkages (commodities and funds) between various participants in the chain, their behaviour, interests and commitment. The project team conducted ad-hoc interviews in three provinces. In total, six farmers, four retailers in district towns, five dealers (wholesalers) in the provincial cities and three importers were interviewed. The provinces were selected based on donor’s interests and they were among the less

developed regions in the country. The subjects covered in the interviews were the following:

- Interview outline for farmers: farmer's profile – years of experience, farming activities, farm size; existing ag-equipment – type, date purchased, place of purchase, brand, new or second hand, price when bought, payment in cash or on credit, market value; intentions to purchase new equipment; brand and price sensitivity; reasons for choosing the vendor; other services received from the vendor (guarantee, maintenance, and service, technical assistance, buy-back option, insurance, etc.); buying strategy from a vendor (in cash, on credit); satisfaction versus credit schemes; capital lease option; delivery process; payment process; relationship with FIs.
- Interview outline for vendors: details of the company (name, number of years of experience, local or international company); coverage area – main office, branches, distributors; clients' profile; ag-equipment products sold; products' market value over the lifespan; other services offered to farmers; details about the selling strategy – in cash and on credit; capital lease option; delivery process; payment process; credit assessment in case of selling on credit; relationship with distributors; relationship with FIs; details of the existing financial partnership or other risk-sharing mechanisms.

Informed consent was obtained from all subjects involved in the study, prior to answering the interviews. The analysis of the information collected, based on written transcripts, observations and notes, was channeled to provide a deep understanding of the segments, going beyond the individual opinions and demographic characteristics. Strategies used for analyzing the results were: exploring key differences (among different segments, respondents' profiles), pattern recognition, and comparison versus opposition.

4. Research objectives

The scope of this work is the design of a conceptual framework for implementing external value chain financing mechanisms to support small farmers' access to loans for ag-equipment. The basis for this partnership mechanism consisted of a research study conducted in a less developed country, with the following objectives, aimed to provide a good understanding of the local agricultural market in general and the agricultural machinery value chain in particular. The research objectives were:

- RO1. Overview of national farm machinery market. Scope: understand and analyze the agricultural environment and equipment value chains (key players and their connections with the agricultural producers, main opportunities, challenges, and risks).
- RO2. Characteristics of the economic participants involved in the farm machinery value chain. Scope: identify the market segments and their specific needs (farmers segments and their characteristics, financial gap in terms of financial and non-financial needs).

The research results were then used to design financial partnership options by answering the following questions: Who might be the participants? What might be the roles

of the various partners involved? How might the process be implemented?

5. Results

5.1. RO1 Overview of the local farm machinery market

Simple machines dominate the local agricultural process, although the use of all types of machinery has increased over the last period. The use of machinery is determined by farm size, the type of crop under cultivation and the geographical zone of the farm: in some regions, households tend to operate larger farms and thus prefer to combine harvesters and large tractors with over 50 horsepower. In regions where dry season rice is cultivated, there is an increasing use of tractors. Low lift water pumps are used to irrigate rice fields, with power tillers often used to drive the pump's engine in some provinces. In some farmers often use centrifugal pumps.

Distribution channel of new agricultural machinery (big and small equipment) is organized on four geographical levels: capital city, provincial level, district level, and farmers' level. A detailed description of the activity of the vendors from each level is provided later on in the paper.

Market demand for tractors and other big ag-equipment loans was still small and limited. According to the some statistics, only 1.21% of the households conduct their agricultural activity on more than 10 hectares (ha) of land. On the other hand, the market is characterized by saturation in some areas: field visits reflected the existence of 2-5 tractor owners in some villages who bought the tractor in the last 3-5 years. The observation was confirmed by dealers who provided lending schemes to farmers and mentioned that farmers' main reason for delaying the repayments was the tractors were not fully used.

The field research reflected several international brands for ag-equipment in the local market sold either through a national network of specialized independent provincial dealers (K. brand) or through local importers (local companies or representatives of international producers:

- K. brand is by far the brand with the most extensive network of dealers in the county.
- Big equipment (tractors, harvesters, power tiller sets): K. brand (specialized independent provincial dealers, JD brand (local importer and its showrooms), Y. brand (importer and wholesalers), MB brand (importer and showrooms), etc.
- Small equipment (power tiller components, water pumps, spraying machines, etc.): many brands from other countries.

5.2. RO2 Characteristics of the actors involved in the farm machinery value chain

Field research reflected following characteristics of participants in the ag-machinery value chain:

Farmers' level. The K. brand is by far the most preferred brand for small and oversized equipment. The main reason mentioned by farmers: "it has a good quality" plus "high notoriety" coming from many K. brand power tillers used by the farmers.

Big farms use big ag-equipment (> 10 ha of cultivated land, diversified farms). Farmers usually buy new equipment because of extending their farming activities. Rental services are offered by 2-5 tractor owners in a village who bought the tractor 3-5 years ago. Rental services need time to develop a network of clients. The farmers buy the new tractors mainly from the K. brand showroom and local shops that have agreements with K. brand dealers. The preferred brand for second-hand tractors is the F. brand because of the lower price, but the maintenance cost is high (>1,000 USD/year). Second-hand tractors are mainly used for the owner's use and not for renting out to others. Second-hand equipment is bought from other farmers in Thailand. The market for secondhand K. brand tractors is not yet developed.

Small farms use new equipment (< 10 ha of cultivated land) and are bought from district town shops. The vendor is chosen according to the brand (go to "that" vendor because "he is selling K. brand") or recommendations coming from friends. Spare parts are found in workshops for car/equipment repairs.

Retailers in district towns' level. There are usually 3-7 shops located in the district's towns, with 7-10 years' experience on the market. They sell small new ag-equipment (components of power tillers: hands, engines, metal and tire wheels, implements, trailers and water pumps, spraying machines) but also other goods or services (construction materials, spare parts, reparations). The most popular brand is K. Small second-hand ag-equipment in car and equipment repair and service providers (spare parts). These small shops (retailers) can collect orders for K. brand tractors and harvesters and get a commission per unit sold. According to retailers, the farmers buy small ag-equipment for their own usage (cropping activities: dry season rice, wet season rice, cassava, soybean, cashew; fishing, and so on). They usually have 2.5 – 5 ha of cultivated land. The farm machinery is delivered immediately. The farmers pay when buying the product in cash. Selling on credit used to be accepted in the past (for tiller hands & engines), but it is no longer.

The retailers buy the products from dealers (K. brand dealers in provincial towns) or wholesalers in capital city. The payment is made within one month, in cash (50%) and via money transfer services (50%). Wholesalers in capital city offer a 2% discount or 10-15 USD/unit for 100% cash payment when buying. Bank transfer, WING, and private agents (exchange houses) are used for money transfers (for a fee of 0.10%).

Retailers usually do not work with banks, and in case they do, they have a preferred bank for money transfer services and a FI for savings. Loans are considered an option in the case of investment plans. The retailers send about 70% of farmers to FIs to take loans to buy the equipment. There is no partnership with any financial institution. The shop owners just tell the clients to "go to the FI they are used to" to take a loan to buy the product.

Dealers in provincial towns' level. Three types of dealers can be found in provincial towns: 1.) K. brand dealers (for big and small equipment); 2.) other brands' dealers (for extensive equipment) which either act on behalf of an importer (and get a commission out of the sales) or act on their own (acting as wholesalers); 3.) wholesalers or retailers (small equipment).

In each province, there are 1- 2 K. brand dealers promoted on the website of the headcounter. K. brand dealers have big showrooms: they sell mainly K. brand new - big and small ag-equipment; only a few second-hand pieces of equipment (provided by leasing companies). The managers admitted it was difficult to sell second-hand equipment because there was no market for them. Prices for tractors vary between: K6,040 – 25,000 USD / K7,040 – 28,000 USD / K9,040 – 31,000 USD. Prices can vary from region to region, depending on other services offered and discounts taken from suppliers. Big K. brand equipment is sold directly to farmers from the dealer's showroom or via sub-dealers who get a commission on each unit sold. Small K. brand equipment is sold via the network of sub-dealers (retailers) and small shops in the district towns (each dealer has approximately. 10 sub-dealers). Sub-dealers are offered one-month credit; they pay in cash or via exchange houses. All clients are offered after-sales services (warranty, maintenance services, technical assistance). 80% of farmers buy the K. brand equipment via leasing companies. Leasing companies have offices at the location of the showrooms. The higher proportion of clients served by leasing companies comes from the fact that the collateral asked by the leasing companies is: 30% farmer's contribution plus tractor tax receipt plus co-signer. 10% of farmers take a loan from banks or FIs. For the remaining 10% of the farmers, the K. brand dealer offers its lending scheme as a loyalty program for old clients.

Importer's level. There are several importers - representative of different foreign producers of ag-equipment. They mainly sell tractors, power tillers, and implements. The farmers buy implements depending on the farming activity they perform. For intensive cropping and specific ag-work (mango, cashew, etc.), farmers buy implements in line with the brand of the tractor. For general farming activities, farmers buy implements and components (different brands) from a local shop, because of the cheaper price. The importers apply different selling strategies: some have only an ag-equipment division, others sell ag-equipment among other products (e.g., heavy construction machines), and others sell ag-equipment besides other ag-products (e.g., ag-chemical and biocontrol, drip irrigation systems, animal feeds and medicine, etc.). Importers apply different approaches in terms of distribution channels developed to reach the clients: local branches (e.g., one importer has showrooms in 4 provinces; another one has branches in 5 provinces), selling through local dealers (one importer has 16 dealers for small tractors; another importer sells all products through 4 dealers; another importer sells its products on a commission-based contract, through 3 local dealers); other importers have only staff that travel in the provinces and contact the farmers directly for all range of company products. Some importers developed their financial schemes for sales directly to farmers (supplier credit – 100%, plus a monitoring scheme to prevent default: GPS plus locking system), other importers do not sell on credit at all, and others signed partnership agreements with different FIs. Two types of financial needs have been identified from discussions with the importers: loans for provincial dealers to pay the tractors in cash (potentially buy-back clause from the importer, but without the dealer knowing that) and loans for farmers to buy tractors from showrooms or local dealers.

5.3. Proposed agriculture value chain financing partnership models

Based on the results of the desk and field research, a few recommendations might come out for the local FIs interested in developing partnership agreements (Table 2):

Table 2. Value chain financing partnership mechanisms based on results of desk and field research

Level	Small new ag-equipment			Big new ag-equipment		
	Retailers	Wholesalers	K. brand dealers	Other brand dealers (act independently, as wholesalers)	Other brand dealers (commission based on importer)	Importer (national network)
District level	Referral program	Referral program				
Provincial-level	Referral program	Referral program	MoU / Risk sharing mechanism	Referral program		
National level					No partnership	No partnership

Partnership mechanism in the form of a “Referral program” with retailers and wholesalers of small new equipment (and in some cases also dealers of big equipment who act independently) maybe be developed because of: high proportion of farmers who take a loan to finance the small equipment and because there is no existing financial partnership between the local shops and a FI (the shops recommend the client to “go to the FI they are used to”). A Risk sharing mechanism is not applicable in this case because of several reasons: farmers already have access to financial services ranging from 100-3,000 USD offered by FIs; retailers stopped providing their lending schemes (the former schemes were mainly serving customers rejected by FIs because of over-indebtedness); there is no tax receipt for small equipment (so it is risky to take equipment as collateral); the market value of the financed small-equipment is highly decreasing after the first year.

In the case of big new ag-equipment, a pre-study of the preferred brand is essential when choosing the partners in the provinces. The farmers might be “addicted” to one brand (e.g., K. brand). In the case of one preferred brand, a Memorandum of Understanding for a Risk sharing mechanism with dealers is recommended at the provincial level, and training for sub-dealers (retailers) is needed. If two or more brands are strong for the same type of equipment, a clause of exclusivity for a province should be tested with two main aspects to be considered: dealer’s selection criteria (financial reports; showroom and inventories; after-sales services; technical team; salesforce - existence and commitment; promotion activities; existing commitments with FIs) and targets to be set according to targets set by the importer plus FIs’ transformation rate.

The data collected from importers have not been cross-checked along the value chain, and consequently, no partnership proposals are possible at this time.

The second-hand ag-equipment market is not well organized; consequently, no partnership models are recommended at this time for K. brand.

6. Discussions: conceptual models on external value chain financial mechanisms

Depending on the desk and field research results, different external financing scheme options can be developed based on partnership agreements between FIs and various participants in the value chain. Rather than relying only on the creditworthiness of individual farmers, external value chain financing mechanisms are based on business relationships in the value chain (buyers-farmers-suppliers). A partnership is always based on a win-win approach. Therefore, the following question should be kept in mind when designing an appropriate financing scheme: "Why would the potential partners be interested in joining the partnership?". According to the actor in the chain with which a FI can interact to implement its financing model, the schemes can be developed either with suppliers or buyers. The models are described below:

6.1. External Value Chain Financing Models with Equipment Suppliers

6.1.1. FI takes over suppliers' loans provided to farmers

This option is based on a tri-party agreement. A FI facilitates finance so that the farmers can pay for the equipment to a retail supplier at the beginning of the agricultural season or whenever needed. This model lets the FI handle the financing using its expertise based on its lending methodology and frees up suppliers' funds for increasing inventory or investment plans. The mechanism is described in Figure 1 and consists of the following steps: 1) the FI conducts the credit appraisal and approves the farmer's loan to pay for the goods purchased from the supplier (retailer); 2) the loan is disbursed to the supplier's account (in case the loan has an extra component that exceeds the price of goods from the supplier, the additional component is disbursed in the farmer's account); 3) Having access to cash, the retailer can buy in bulk (especially for small equipment) and pay in cash to the wholesaler, benefiting from reduced price; 4) the supplier delivers the equipment to the farmer; 5) the farmers repay the loan to FI.

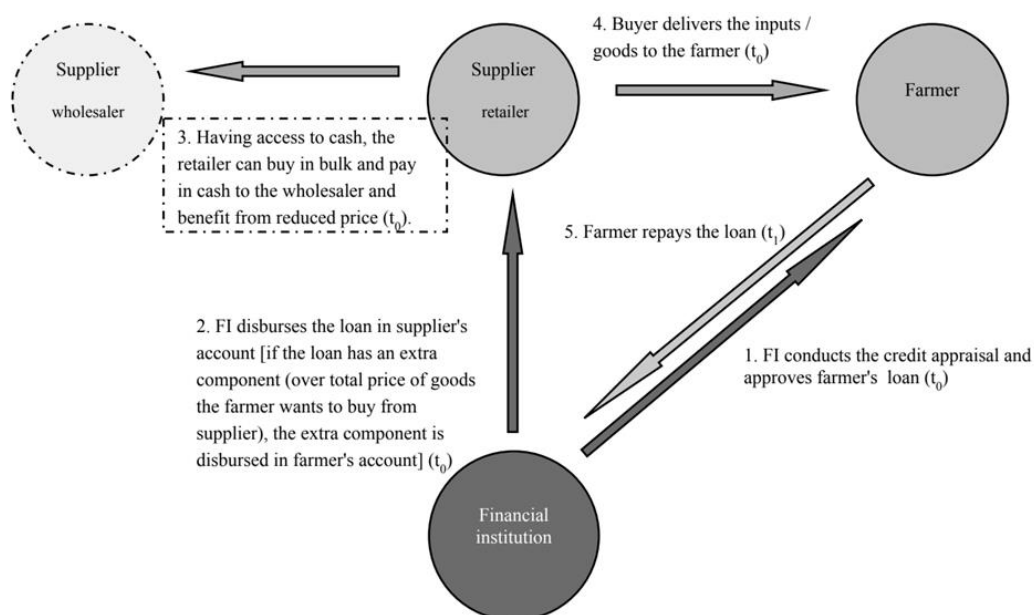


Figure 1. Financial Institution takes over suppliers' loans provided to farmers

Two problems might show up in case of a FI taking over suppliers' lending schemes:

1. Farmers do not have enough collateral. Therefore, when providing a loan to suppliers, the suppliers do not usually ask for collateral from farmers, preferring to work on credit with farmers they know very well. However, in the case of big equipment suppliers, most dealers that sell on credit ask for collateral that is usually pledged over the equipment (the same type of collateral is generally asked for by leasing companies). In this case, some options for alternative collateral for FIs in this case are:
 - Pledge on equipment + buy-back clause from dealer's side (in case of default, the dealer buys back the equipment at market value). In this case, it is essential to clarify with the dealer aspects related to monitoring the usage of the equipment and technical maintenance of the equipment over the loan duration. Other aspects to be taken into consideration are:
 - The dealer might be sensitive to the buyback clause (because of no local market for second-hand equipment). Then, the scheme can be tested for a maximum number of equipment (e.g., three tractors) until the dealer gets trust in FI's lending methodology.
 - The market value of the equipment over the loan duration is less than the balance of the loan. In this case, the options would be: either to set the farmer's down payment for the loan at a higher level or to ask the dealer for a deposit to cover a certain percentage of "eventual" loss.

- Pledge on receivables from buyers of farmers' products. This option is applicable in the case of tight value chains, where the farmers do not have many opportunities to sell their products.
- 2. The loan cost is higher than the cost of the supplier loan, and the farmers are sensitive to price. In this case, FI can ask the dealer for a deposit over the loan duration (e.g., 10% of the loan amount), to be used as risk-sharing collateral for the loans. The deposit offers the FI the possibility to reduce the cost of the loan and, consequently, the loan price (interest rate, IR). The following example will clarify this aspect.
- Classic loan features (Table 3): loan amount = 10,000, IR = 2.5% per month, loan duration = 5 months (M), repayment of capital in the last two months => internal rate of return (IRR) for the investment = 2.5%.

Table 3. Calculation of IRR in case of a classic loan offered by a FI

Interest rate	2.50%				
Loan amount	10,000				
	M1	M2	M3	M4	M5
TOTAL CASH OUT	-10,000	0	0	0	0
<i>Disbursed in supplier's account (or paid to farmer's account and transferred to supplier's account)</i>	-10,000				
TOTAL CASH IN	0	250	250	5,250	5,125
<i>Loan repayment - Capital</i>				5,000	5,000
<i>Loan repayment - Interest</i>		250	250	250	125
TOTAL CASH FLOW	-10,000	250	250	5,250	5,125
IRR	2.50%				

- Value chain loan features (Table 4): to get the same "profitability" of the same investment (the same IRR), for the loan in which only 90% of the loan amount is initially disbursed to the farmer to be transferred to the supplier for the equipment bought, and the remaining 10% to be kept in a "client deposit guarantee account," the IR charged to the client is 2.28%.

Table 4. Calculation of IRR in case of a classic loan offered by a FI

Interest rate	2.28%				
Loan amount	10,000				
	M1	M2	M3	M4	M5
TOTAL CASH OUT	-10,000	0	0	0	-1,025
<i>Disbursed in supplier's account (or disbursed in farmer's account and transferred to supplier's account)</i>	-10,000				
<i>Supplier's risk-sharing account or Client deposit guarantee account (10% of loan)</i>					-1,025

Interest rate	2.28%				
amount, 0.5% interest rate per month)					
TOTAL CASH IN	1,000	228	228	5,228	5,114
Loan repayment - Capital				5,000	5,000
Loan repayment - Interest		228	228	228	114
Supplier's risk-sharing account or Client deposit guarantee account	1,000				
TOTAL CASH FLOW	-9,000	228	228	5,228	4,089
IRR	2.50%				

6.1.2. Referral program

Sometimes there is no supplier credit (transactions at the supplier level are mainly done in cash, farmers being supported by existing financial institutions) or the supplier wishes to maintain its current lending scheme (but still farmers have complementary financial needs). In this case, the FI can involve the supplier in a Referral program (Figure 2), the supplier being mainly used as a “connection” point with the farmers, helping the FI find eligible clients and reducing the costs. Several options are possible here:

- Simple referral program, with a focus on commercial strategy (recommended in non-competitive financial environment): retailers are involved as intermediaries in advertainments campaigns during the high season, with commercial message content adapted to agriculture small equipment market and simple examples of loan repayment schedules.
- Medium referral program (recommended in higher competitive financial environments): retailers are given an incentive to get involved in the lending scheme in the form of a small commission / loan approved. In this case, a follow-up of clients' references (both by the FI and the suppliers) is needed.
- Complex referral program based on targets set for supplier + a higher commission linked with a certain number of clients or loan amount approved. Follow-up of clients' references is needed in this case, as well.

In both medium and complex referral programs, the FI must fix the level of the commission to be paid to retailers taking into account the cost of the prospect and the client transformation rate.

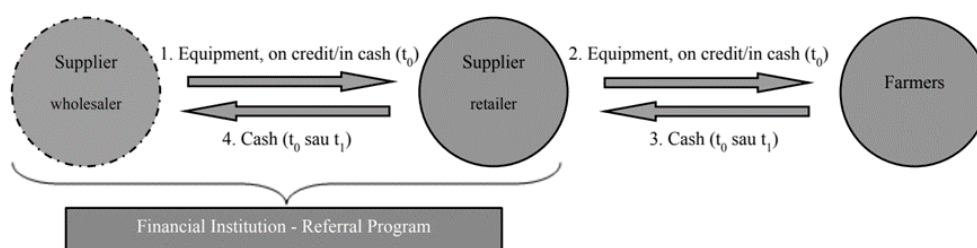


Figure 2. Financial Institution Referral program.

6.2. External Value Chain Financing Models with Equipment Buyers

Financing solutions that rely on buyers as a source of repayment are based on the entire value chain study. Legal or informal contracts protect strong commercial connections between farmers, buyers and lenders. FIs under these models take loan decisions based on the performance of the value chain and the repayment capacity of the individual farmers. The basic principles of a partnership with the buyers are:

- to leverage the purchasers' deep knowledge of their suppliers (farmers) to identify trustworthy borrowers based on their primary concerns: safeguarding their acquisition.
- to make payments easier through receivables assignment.
- Accordingly, the intervention of the buyers might be:
- in the selection process: buyers' field agents are familiar with the farmers and may make a pre-selection linked to personal awareness of the farmers' moral character and abilities; this would significantly reduce the bank's intermediation costs.
- during the recovery procedure: installments are deducted directly from the processors' payments to producers that would otherwise be assigned to the bank. This arrangement would necessitate the signing of a three-party contract.

To ensure that buyers take their pre-selection process seriously, it is preferred that they bear some of the risks. When it comes to providing loans to the farmers, the buyer and the FI have common interests: FI is searching for qualified clients; buyers want to do business with producers that can deliver sufficient quantities and quality. However, their concerns and objectives are not identical. Although the buyers want to see producers make investments that will enable them to deliver larger quantities and higher quality, FIs are always more concerned with the producers' desire and capacity to repay their loans. This will force the FI to do its own risk assessment at all times. However, in case the buyers are involved in the selection procedure, the most effective strategy to ensure that they pre-select suppliers (farmers) who look moral and financially healthy is to assume a portion of the credit risk.

Some important aspects should be taken into consideration in establishing value chain financial schemes with buyers: buyer and financial institution need to agree together on the loan amount the farmer can repay (based on expected and historical records on sales and prices provided by the buyer); commitment of both parties in the selection process is essential; the risk of side-selling (farmers sell elsewhere) should be taken into consideration (is the buyer taking any kind of measures in this respect, e.g., monitoring schemes to ensure delivery of products?); responsibility in case of low production/losses should be defined.

There are two options for FIs interested in establishing financial partnership agreements with buyers along the value chain:

6.2.1. FI takes over buyers' pre-financing scheme (advances) provided to farmers

The mechanism is described in Figure 3 and consists of the following steps: 1) FI conducts the credit appraisal and approves the farmer's loan to pay for the goods purchased from the buyer; 2) the loan is disbursed to the buyer's account (in case the loan

has an extra component that exceeds the price of goods from the buyer, the extra component is disbursed in farmer's account); 3) the buyer delivers the goods to the farmer; 4) the farmer is selling the ag-outputs to the buyer; 5) the buyer repays the loan to the FI, and 6) the buyer pays the farmer the balance (sales-loan).

This option can free up buyers' funds (which can be used for other purposes) and lower their lending risk.

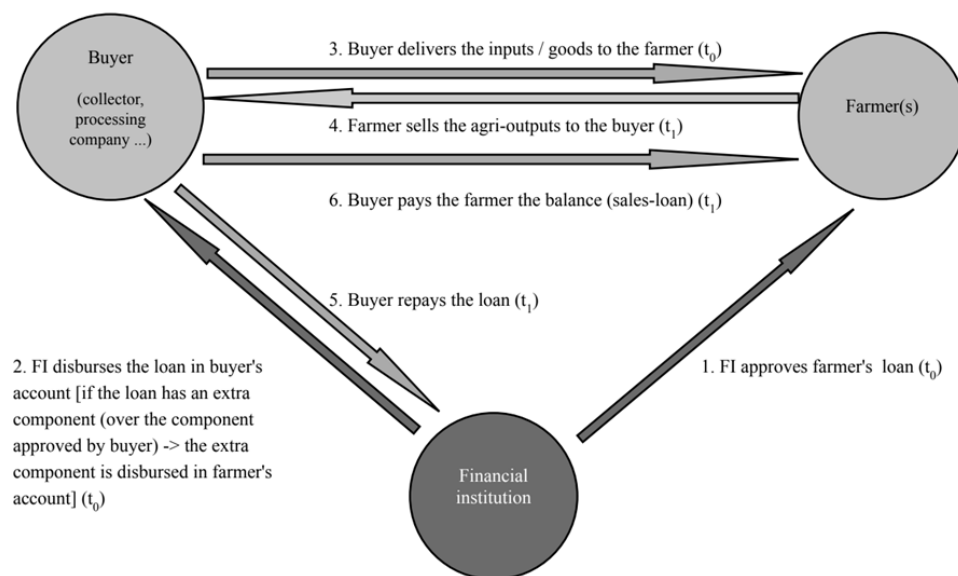


Figure 3. FI takes over buyers' pre-financing scheme (advances) provided to farmers

6.2.2. FI is financing farmers' complementary investment needs.

The mechanism is described in Figure 4 and consists of the following steps: 1) FI conducts the credit appraisal, approves the farmer's loan and disburses it into the farmer's account; 2) the farmer uses the loan to finance his investment needs; 3) the farmer sells the ag-outputs to the buyer; 5) the buyer repays the loan to the FI; 6) the buyer pays the farmer the balance (sales-loan). This scheme has the advantage of increasing the production capacity of the farmers and securing increased supply.

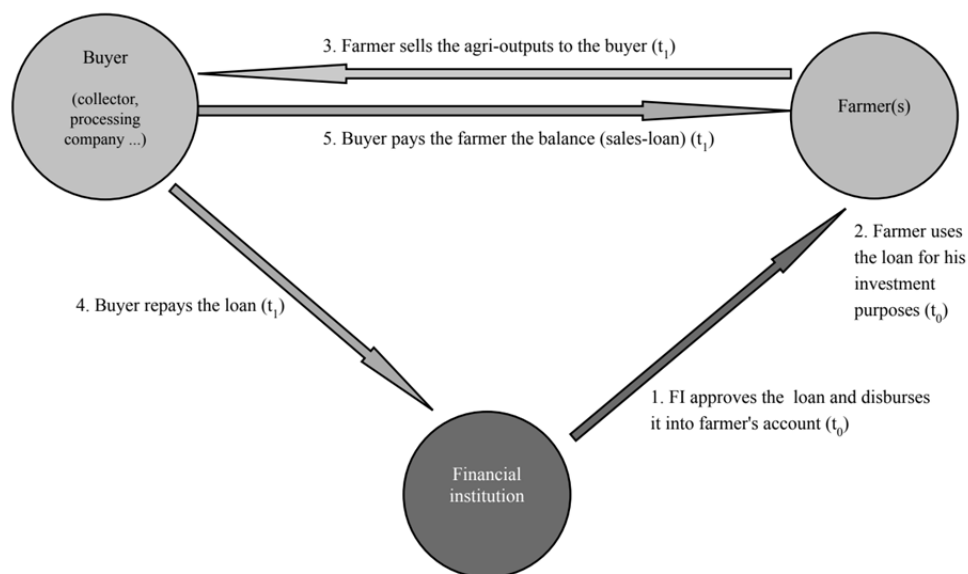


Figure 4. FI is financing farmers' complementary investment needs

7. Conclusions

The ag-food supply chain is highly distinctive in terms of economic characteristics and this uniqueness has repercussions for all participants involved in or associated with this sector (Sporleder & Boland, 2011). Local institutions and regulatory frameworks (Todeva & Rakhmatullin, 2016), digital technology (Siaw, et al., 2022), and market-related factors drive the sustainability adoption within the value chain and financing-related constraints challenge their comprehensive implementation. Therefore, aligning different stakeholders' perceptions and activities and solid cooperation between producers, cooperatives, private firms and public institutions is strongly recommended (Prazeres, et al., 2022).

The current paper addresses both the knowledge gaps existing in current literature and the requirements of practitioners in the field of financial inclusion, especially microfinance institutions. When compared with existing literature, the novelty of the paper is summarized in Table 5:

Table 5. Summary of paper novelty revealed by the results of the research and proposed conceptual models

Knowledge gap reflected by existing literature (Reflected in Section 2)	The novelty of the paper (Reflected in Sections 5 and 6)
- Existing literature on agricultural value chain finance mainly focuses on the internal agriculture value chain finance mechanisms	- The paper provides insights into the process of setting up external agricultural value chain financial intervention options based on real situations.

- The step-by-step process of setting up the agricultural value chain financial intervention mechanisms is not practically described in existing literature (a development strategy is useful to practitioners in the field of microfinance).	- The proposed market assessment scheme reveals the possibility of developing multipartite value chain partnership options based on business relationships in the value chain (buyers-farmers-suppliers) to facilitate farmers' access to loans when purchasing agricultural equipment. These proposed mechanisms rely on a "Win-Win" approach for the farmer, the buyer-supplier and the FI. The proposed guidelines can be implemented by any financial institution.
- The primary focus of the majority of the studies are technical constructs of the agricultural value chains and not development of strategies on how to enhance access to inclusive finance via value chain mechanisms	- Because of their outreach (financial vulnerable small farmers) and their ability to generate economic value and employment, the proposed models of financial mechanisms are both inclusive and sustainable and therefore, they are an important component of agricultural growth in many developing countries.
- Lack of studies on financial mechanism related to agricultural machinery supply chain	- The proposed financial mechanisms address specific aspects related to ag-equipment supply chain.

The limitations of this research include analyzing the sustainability and feasibility of the supply chain. Good cooperation between partners in the value chain is crucial. Therefore, value chain finance mainly works in the more integrated sectors where farmers have few market options for side-selling. Since there is no general rule for designing value chain financing mechanisms (they have to be developed based on market assessments), creating a scheme takes quite a long time, impacting the seasonality need for ag-financing. Collateral is still essential, but it could be lower if a risk-sharing mechanism is developed. This conceptual model is limited to support sustainable interventions mechanism in developing countries.

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