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Research Article

IMPACT OF AGRICULTURAL VALUE CHAIN FINANCING ON SMALLHOLDER FARMERS' LIVELIHOODS IN RWANDA CASE STUDY: RWANDA RICE VALUE CHAIN

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ABSTRACT

The study was designed to analyse the impact of Agriculture Value Chain Financing on Livelihoods of Smallholder Farmers in rural Rwanda. The objective was to explore different strategies, models, instruments and tools which can help small scale farmers in improving access to finance for commercially-oriented investments in agriculture sector. The case study was conducted at the rice cooperative "COOPRIKI-CYUNUZI: Coopérative des Riziculteurs de Kibaya- Cyunuzi", based in Gatore Sector, Kirehe District, Eastern Province, Rwanda. The cooperative was linked to inputs suppliers, FIs, rice foctoring plants and difeerent markets. The cooperative supplied rice paddy to differents rice milling companies, and worked with few Financial Institutions. It identified certain constraints that were faced by smallholder farmers in credit acquisition, and proposed alternative solutions to overcome those constraints. Both farmers and FIs expressed that farmers encountered constraints to access formal credit. COOPRIKI-CYUNUZI received both Government and Developement Agencies's financial support in the form of grants and capacity building, as well as loans from few FIs. Farmers aknowledged that the financing received, though insufficient had impacted positively their lives' standards. They expressed that by engaging them in rice production and working with FIs, resulted in increased access to health services, educational services for their children and enabled them to acquire new assets.

INTRODUCTION

In the developing world, agriculture plays a critical role in the entire life of the economy. It remains the backbone of economic system of developing countries. In addition to providing food and raw materials to the industrial sector, agriculture is the main source of livelihood of majority of rural polulation, providing employment opportunities to a very large percentage of population. For the 70 percent of the world's poor, who live in rural areas, agriculture is the main source of income and employment (www.worldbank.org/ Agriculture&Rural Development | Data - The World Bank). In Rwanda, the government has a good governance and political will to develop the agricultural sector as it is being the economic backbone of the country by employing about 80% of the population, contributing 32-34% to the national GDP and generating about 70% of the total export. It also provides 90% of national food needs (RAB, 2013).

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Agriculture contributes immensely to Rwandan economy in many ways, such as, in the provision of food to the population; supply of raw materials and provision of markets to the industrial sector; a major source of employment generation, foreign exchange earnings, etc. Under EDPRS II (2013-2017), the second phase of the Economic Development and Poverty Reduction Strategy is moving towards achieving or surpassing the long-term targets of Vision 2020 and the MDGs. The overall goal of EDPRS II is to accelerate progress to middle income status and better quality of life for all Rwandans through sustained growth of 11.5% and accelerated reduction of poverty to less than 30% of the population." Rural development" is among the four thematic areas and priorities of EDPRS II:

- Economic transformation,
- Rural development,
- Productivity and (iv) youth employment and accountable governance.

The first three priorities are particularly of relevance to the agricultural sector:

- **Economic Transformation** will operate diversification of the economic base and better external and internal

connectivity, as well as the private sector investment in value chains and agri-processing facilities.

- **Rural Development** aims at increased agricultural productivity to reduce poverty and rural infrastructure development to connect farmers to markets.
- **Youth and Productivity** focuses at **s**kills development and sensitisation focused on youth, as well as supporting entrepreneurship, access to finance and agri-business development.

Therefore, Agriculture is recognized in EDPRS II as a priority sector of the economy that will both stimulate economic growth and make the greatest contribution to poverty reduction with a primary objective of increasing rural households' incomes, providing incomes from diversified sources, and increasing food security. The strategic vision for the current third generation of the Agriculture strategy, PSTA III in the next five years is a focus on both increased production of staple crops and livestock products and greater involvement of the private sector to increase agricultural exports, processing and value addition. Total Production of vegetables and fruits continued to increase, where vegetables production increased by 9% between 2011 and 2013, while fruits production increased by 18% in the same period. On the other hand vegetables exports counted an increase from 15.4 ('000 Tons) in 2012 which generated 5,013,260 USD to 31.9 ('000 Tons) which generated 9,494,442 USD. Animal products have gone up, especially milk from 628,266 tons in 2013 to 706,030 tons in 2014, meat and fish which increased up to 706,030 tons (628,266 tons in 2013), 86,348tons (81,087 tons in 2013) and 28,450 tons (24,550 tons in 2013) respectively in 2014(NISR-(SYB 2016). Investing in high-value crops while also exploiting the opportunities offered by staple crops is key for the future, facilitating both domestic food security and higher rural incomes.

« Value Chain Development and Private Sector » constitues the third Programme of the PSTA III, Sub-Programme3.7. Agricultural Finance aims at improving financial services in rural areas, strengthening, expanding and introducing new agricultural finance instruments by implementing main lines of Action, (PSTA III), respectively:

- Consolidate SACCOs at the District level under an Agricultural Cooperative Bank
- Establish a warehouse receipts system
- Expand agricultural insurance and rural finance
- Facilitate value chain finance relationships

In light of the above GoR's initiatives, Agricultural Value chain development and financing approaches becomes absolutely a tool that can boost the development of the Agriculture sector and increase incomes of rural active households engaged in farming activities. Adequate and timely financial services through 'Value Chain Finance' can help farmers to raise productivity, make optimal use of value addition, open market opportunities for their produces; and therefore, improving their livelihoods.

Problem formulation

In developing world, majority of rural small farmers depend on related subsistence farming activities. They live in precarious conditions, threatened by lack of income, shelter and food, medical services, education of their children and other basic needs. To overcome poverty and be able to improve their livelihoods, they need to borrow money for investing in their lands exploitation, making savings to protect their families against risks. Therefore, increasing finance in the agriculture sector is the way of lifting smallholder farmers living in extreme poverty towards sustainable development. Financial practitioners worldwide have set a number of initiatives to increase the supply of finance to the agriculture sector; "Agriculture Value Chain Finance" approach is at the center of the heart, absolutely as a necessity to the economic growth in the development world. Rwanda hasn't been left behind in promoting agriculture financing. In light of the PSTAII, Sub-Programme 3.6: Strengthening rural financial systems, the GoR has made substantial efforts to build sustainable rural financial systems that provide access to financial services for rural people, through establishment of numerous credit enhancing vehicles such as, special funds and lines of credit, RIF1 (Rural Investment Facility) and RIF2, Agricultural Guarantee Fund (AGF), Crop and Livestock Insurance, etc. Other financial facilities are provided by MINAGRI's (Ministry of Agriculture) agencies. Despite all these efforts mobilized by the GoR to promote agriculture financing in Rwanda, the agriculture sector in Rwanda remains generally perceived by the financial sector as very risky; challenges inherent in the value chains hinder flow of finance. Most of agricultural projects in Rwanda are poorly financed with scarce specialized products. Due to lack of collaterals, low productivity and production, unpredictable climate changes, inadequate storage and processing, and market uncertainties, access to finance becomes very limited. Especially, smallholder farmers engaged in primary production, but without adequate collaterals frequently complain about a lack of access to working capital loans needed to buy and apply inputs and fertilizers, pay labor for the land preparation and maintenance, prepare the harvest, and handle the produce to meet the markets, etc. Farmers also need long term finance to invest in post-harvest infrastructures and marketing They also need other basic related services such as crop insurance, savings, transfers, potentially needed to support investments along the chain.

Given the background of the problem, the following are the research questions:

- Are the existing alternative financial mechanisms, risk mitigation products and economic models for Value chain Finance approach work efficiently to raise the productivity and income growth for smallholder farmers?
- Which constraints are limiting smallholder farmers' accessing finance in Agricultural Value Chain model, and what can be done by stakeholders to overcome those constraints?
- How AVCF can impact the livelihoods of smallholder farmers and what should be the roles of different stakeholders in promoting this approach?

Theoritical framework

The role of agriculture value chain finance is to address the needs and constraints of those involved in that chain. This is often a need for finance but it is also commonly used as a way to secure sales, procure products, reduce risk and/or improve efficiency within the chain.

Therefore, atheoretical framework is useful for understanding value chain finance approach.This is important because value chain finance is both an approach to financing as well as a set of financial instruments which are utilized to expand and improve financial services to meet the needs of those involved in the value chain.

METHODOLOGY

Study Area: The study was carried out in COOPRIKI-CYUNUZI: "Coopérative des Riziculteurs de Kibaya-Cyunuzi" located in Kirehe District of the Eastern Province of Rwanda.

Source of data: Both primary and secondary data were collected. Primary data was gathered by collecting data through questionnaires distributed to key informants: COOPRIKI-CYUNUZI Management Team, lead farmers, selected farmers, staff of supporting agencies and banks 'officials, both have been working closely with the cooperative. Secondary data were collected through a desk review of existing documentation and literature on Rwanda Rural and Agriculture Finance and Rwanda Rice Value chain.'

Researchmethods used: Two research methods: "descriptive qualitative" and "correlational analysis" methods have been combined in this research study: Edvantia SBR Rating for Technical Assistance Programs and Services form (2007) and Carter McNamara Overview of Methods to Collect Information handout (1998) provided definitions of these research methods:

- **Descriptive qualitative method** which is a detailed description of specific situation(s) using interviews, observations, document review was used by collecting secondary data and conducting a document review of existing reports, books, policies, on agriculture financing in Rwanda and Rwanda Rice-sub sector to know the status of level and types of financing received in COOPRIKI-CYUNUZI
- **Correlational analysis** method is a **quantitative analysis** of the strength of relationships between two or more variables. This method was used by collecting primary data through structured questionnaire with a mix of open and closed ended questions that was distributed to selected respondents. A "correlational analysis" between dependent and independent variables was done using the SPSS (Statistical Package for the Social Sciences) software to understand the relationship between AVCF in COOPRIKI-CYUNUZI and livelihoods of the cooperative's members (rice growers). Correlation quantifies the extent to which two quantitative variables, X and Y "go together." When high values of X are associated with high values of Y, a positive correlation exists. When high values of X are associated with low values of Y, a negative correlation exists
(http://www.sjsu.edu/faculty/gerstman/StatPrimer).

Population and sample selection: The targeted population was the 2,856 small holder farmers growing the rice paddy in Kibaya and Cyunuzi marshlands, and members of COOPRIKI-CYUNUZI rice cooperative based in Gatore sector, Kirehe district of the Eastern Province of Rwanda.The sample size was 50 selected respondents from that population of 2.856 rice growers comprised of COOPRIKI-CYUNUZI, Management Team, lead farmers and other selected ccooperative's members. In addition to them, the researchers met other 5 selected people from FIs and other staff working for COOPRIKI's supporting agencies (BPR, URWEGO OPPORTUNITY BANK, SACCO GATORE, and KWAMP) who have been working closely with the cooperative on access to finance related matters. The total number of selected people to respond to the questionnaire was 55 respondents.

Data analysis and presentation process: SPSS software, coding and thematic analysishave been used for data analysis and presentation.

The case study

The Cooperative of rice growers, "COOPRIKI-CYUNUZI" in abbreviation called "Coopérativedes Riziculteurs de Kibaya-Cyunuzi",is located in Cyunuzi village, Gatore sector, Kirehe District, Eastern Province of Rwanda. The cooperative is made up by 2.856 members. The purpose of COOPRIKI-CYUNUZI is to promote the interest of the rice farmers by mobilizing them to join efforts in finding solutions to challenges of poverty and middle men buyers who buy their paddy at a low price. The cooperative has to ensure that the entire paddy produced in the area is channeled through the cooperative for better prices. The cooperative facilitates also acquisition of other services related to production and marketing that are available at cooperative level. Different government agencies such as the Rural Sector Support Project (RSSP) and Kirehe Community Based Watershed Management Project (KWAMP), both projects of MINAGRI, as well United States Agriculture Development Foundation (USADF) –Rwanda provided a technical (capacity building) and financial support to COOPRIKI-CYUNUZI. COOPRIKI-CYUNUZI work with FIs uch as the Banque Populaire du Rwanda, Urwego Opportunity Bank and SACCO Gatore, at different periods of the year to finance VC different needs.

Financing received by COOPRIKI-CYUNUZI's rice producers for chain activities

Rice producers in COOPRIKI-CYUNUZI need financing for different activities along the chain, for

- Inputs acquisition (fertilizers, seedlings),
- Field operations (rice nurseries establishment and maintenance, plowing, pudding, fertilizers and chemicals application, irrigation, weeding and birds guarding),
- Harvest and post-harvest activies, and
- Marketing activities. Both fis and development agencies provided financing in different forms (loans and grants) to coopriki-cyunuzi at different times for chain activities.

The research period covers 4 consecutive seasons (Season B 2014- Season A 2016). Urwego Opportunity Bank, Banque Populaire du Rwanda, and SACCO Gatore(FIs) at one side, RSSP Project, KWAMP Project and USADF-Rwanda at the other side (development agencies).

The Table 1 shows total loans provided by Urwego Opportunity Bank to COOPRIKI-CYUNUZI, as well as estimated Government financial support, all provided for inputs acquisition on a period of four (4) successive seasons. (COOPRIKI Management, primary and secondary data).

Table 1. Loans and Governement's subsidies provided by UOB to COOPRIKI for inputs acquisition (Season B 2014- Season A 2016) (in Frw - Rwandan Francs)

Period	UOB Loan	Gvt Subsidies
Season B 2014	58,000,000	194,670,000
Season A 2015	49,000,000	194,670,000
Season B 2015	59,000,000	194,670,000
Season A 2016	44,000,000	194,670,000
Total loans received	210,000,000	778,680,000

Source: COOPRIKI-CYUNUZI Management, 2015

Financing received for inputs acquisition

In a period of four (4) successive seasons, UOB has provided a total loan worth Frw 210,000,000, and the Government has provided an estimated total subsidy of Frw 778,680,000 to COOPRIKI-CYUNUZI for inputs acquisition.

Loans received for field operations

Field operations include rice nurseries establishment and maintenance, plowing, pudding, fertilizers and chemicals application, irrigation, weeding and birds guarding, and it takes 6 months for the rice paddy to mature.

Table 2. Loans provided by FIs to COOPRIKI-CYUNUZI for field operations (Season B 2014- Season A 2016) (in Frw - Rwandan Francs)

Season B 2014	Season A 2015	Season B 2015	Season A 2016	Total loans received
UOB		16,005,000		16,005,000
SACCO GATORE		15,800,000	23,000,000	15,800,000
BPR		1,500,000		1,500,000
Total loans received				56,305,000

Source: COOPRIKI –CYUNUZI Management, 2015

Unlike for the inputs acquisition, field operations for rice growing receive less formal financing. Farmers were obliged to look for other alternative sources, such group savings commonly called "ibimina" in rural areas, money rented from relatives, etc. The Table 2 shows that the total loan amount received for field operations in COOPRIKI-CYUNUZI is much lesser that the inputs loan received in the same period (Season B 2014-Season A 2016). In 2012, RSSP rehabilitated irrigation systems in COOPRIKI's marshlands at a cost of Frw 75,000,000 (COOPRIKI Management, secondary data). The Table 2: Summarizes the formal credit amount that FIs provided to COOPRIKI-CYUNUZI for field operations.

Funds received for Harvest and Post-Harvest investments and activities

As far as the rice is concerned, harvest and post-harvest periods require both short time working capital loans for the paddy collection and handling, as well as long term investment financing for Post-Harvest equipment (tauplins) and Post-HarvestH facilities (drying grounds and stores).

As to date, COOPRIKI-CYUNUZI has received a financial support from different stakeholders which helped the cooperative to establish Post-Harvest infrastructures along the rice cultivation areas in Cyunuzi and Kibaya marshlands. Both, Government, development agencies and FIs have provided finance to COOPRIKI's post-harvest investments during the period starting 2008 to 2016. The following Figure 1.illustrates at which extent stakeholders have financed post-harvest investments in COOPRIKI-CYUNUZI.

Loan received for paddy marketing and selling

In season B2015, UOB provided a loan worth Frw 165,000,000 to COOPRIKI in order to allow the cooperative collecting the paddy from farmers, while USADF-Rwanda provided the cooperative a "Paddy Purchase Fund" worth Frw 25,000,000. COOPRIKI sold the paddy to different markets, at different prices.

Conclusion on utilization of funds received

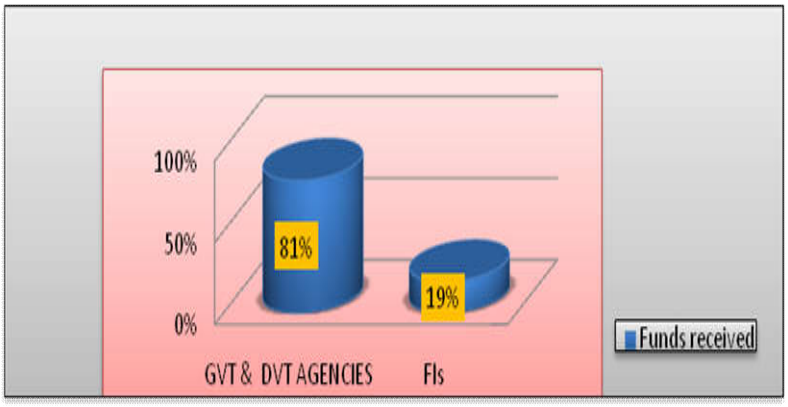
COOPRIKI-CYUNUZI received both formal credit from FIs as well as funds from the Government or other support organizations to finance different activities during rice paddy primary production, harvest and post-harvest, paddy marketing and selling for the period (Season B2014 to Season A2016). With regard to funds provided by FIs, Government and development agencies, results show that:

- Inputs acquisition received a total amount of Frw 988,680,000. The loan from FIs equal to Frw 210,000,000 represents 21% of funds received, Government and development agencies' financial support equal to Frw 778,680,000 represents 79%.
- Field operations received in total insignificant amount totaling Frw 131,305,000 compared to inputs acquisition for the same period. The loan amount from FIs equal to Frw 56,305,000 represents 43% of the total funds received, Government and development agencies' financial support which is Frw 75,000,000 represents 57% of the total funds received for those activities.
- Funds received by the cooperative for Post-Harvest activities and investments are totaling Frw 385,922,940. The cooperative received less loan amount equal to Frw 72,000,000 representing 19% and much Government and development agencies' financial support equal to Frw 313,922,940 representing 81% of total funds received.
- Paddy product marketing and selling activities received total funds equal to Frw 190,000,000 including the loan rceived from UOB equal to Frw 165,000,000 representing 87% of the total funds received, and insignificant Government and development agencies'financial support of Frw 25,000,000 representing 13% of the total funds received.
- FIs are still reluctant to provide adequate finance to agriculture activities along the value chain. Governement and related agencies provide financial support to AVC activities in the form of subsidies or grants, mostly for inputs acquisition and Post-Harvest investments, field operations are negligated.
- MFIs and SACCOs are the most loans providers in the primary production, while commercial banks are interested in Post-Harvest investments and products marketing financing.

Table 3. Funds received from stakeholders for COOPRIKI-CYUNUZI's Post-Harvest investments (in Frw - Rwandan Francs)

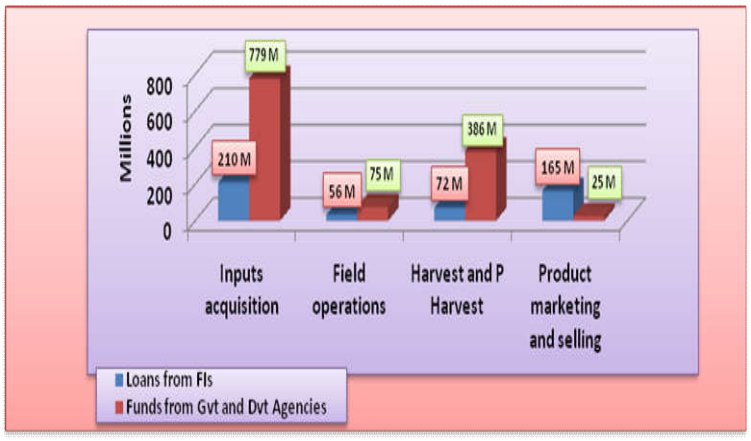
Financing Agency		Funds received		% of Funds received	Post-Harvest equipment/Infrastructure	Period
GVT & DVT AGENCIES	RSSP	131,922,940	313,922,940	81%	12 drying yards	2008-2010
	KWAMP	84,000,000			6 drying yards	2010-2012
	NGOMA DISTRICT	28,000,000			2 drying yards	2014-2015
	KWAMP	70,000,000			3 drying yards & 3 stores	2015-2016
FIs	BPR	72,000,000	72,000,000	19%		
Toal Funds received		**385,922,940**	**385,922,940**	**100%**		

Source: COOPRIKI-CYUNUZI Management, 2015



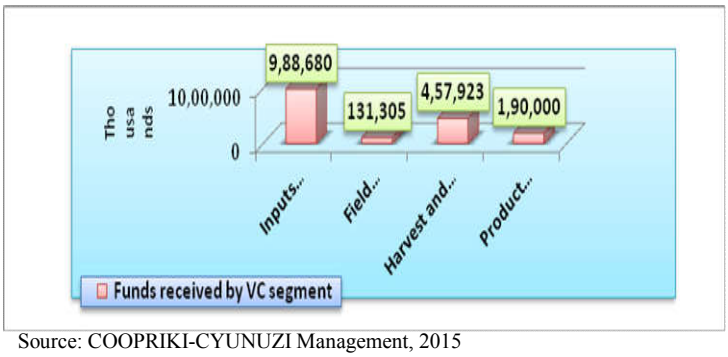
Source: COOPRIKI CYUNUZI Management, 2015

Figure 1. Funds received for Post-Harvest investments in COOPRIKI-CYUNUZI



Source: COOPRIKI –CYUNUZI Management, 2015

Figure 2. Total funds received by COOPRIKI-CYUNUZI during paddy production, Harvest & Post-Harvest and Marketing process (Season B 2014- Season A 2015)



Source: COOPRIKI-CYUNUZI Management, 2015

Figure 3. Funds received by KOOPRIKI value chain segment

Table 4: Correlation analysis between financing received in COOPRIKI-CYUNUZI and livelihoods of Cooperative's members

		Funds	Productivity	Assets	Education	Health	Savings	Off farm activities	Food consumption
Funds received	Pearson Correlation	1	.682**	.624**	.589**	.733**	.663**	.545**	.615**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	50	50	50	50	50	50	50	50
Level of productivity	Pearson Correlation	.682**	1	.847**	.862**	.700**	.949**	.774**	.727**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	50	50	50	50	50	50	50	50
Level of investment in new assets	Pearson Correlation	.624**	.847**	1	.793**	.699**	.885**	.820**	.830**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	50	50	50	50	50	50	50	50
Level of education services	Pearson Correlation	.589**	.862**	.793**	1	.778**	.853**	.801**	.711**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	50	50	50	50	50	50	50	50
Level of health services	Pearson Correlation	.733**	.700**	.699**	.778**	1	.690**	.743**	.717**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	50	50	50	50	50	50	50	50
Level of producer savings	Pearson Correlation	.663**	.949**	.885**	.853**	.690**	1	.795**	.747**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	50	50	50	50	50	50	50	50
Level of nvestment in off farm activities	Pearson Correlation	.545**	.774**	.820**	.801**	.743**	.795**	1	.910**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	50	50	50	50	50	50	50	50
Level of diversified food consumption	Pearson Correlation	.615**	.727**	.830**	.711**	.717**	.747**	.910**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	50	50	50	50	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed)									

Source: COOPRIKI-CYUNUZ primary data,2015

Table 5.Constraints presented by COOPRIKI's farmers in credit acquisition

Constraints for farmers to access credit	4	3	2	1	Sum of Ranking	Position of Ranking
Lack of collateral security	26(4)	19(3)	3(2)	2(1)	172	1
Lack of guarantor	23(4)	21(3)	4(1)	2(2)	169	2
High interest rates	23(4)	20(3)	4(2)	3(1)	167	3
Lack of information of bank information	19(4)	17(3)	12(2)	2(1)	165	4
Lack of good business plans	21(4)	20(3)	6(2)	3(1)	165	4

Source: COOPRIKI current research questionnaire's repondents, 2015

Table 6.Factors influencing access to credit presented by the supply side (FIs)

SCALE/FACTORS	4	3	2	1	Sum of Ranking	Position of Ranking
Profitability of Investment	4(4)	1(3)	0(2)	0(1)	19	1
Level of risk bearing	4(4)	1(3)	0(2)	0(1)	19	1
Collaterals	3(4)	2(3)	0(2)	0(1)	18	2
Interest rate	3(4)	1(3)	1(2)	0(1)	15	3
Loan transaction cost	2(4)	1(3)	1(2)	1(1)	14	4
Availability of credit	1(4)	1(3)	2(2)	1(1)	10	5

Source: Primary data, 2015

Impact analysis of finance received inCOOPRIKI - CYUNUZI on livelihoods of rice growers

Chambers and Conway (1992) defined livelihood in these terms: "A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living". Which literally means "livelihood" is the means, activities, entitlements and assets by which people make a living. This section analyses how financing received in COOPRIKI-CYUNUZI for rice paddy production have impacted the livelihoods of rice producers in terms of positive changes (new assets acquired, cattle, goats, motorcycle, savings made, new off-farm activities, increase in health services and education, …) that occurred during their experience by working with FIs and other development agencies through COOPRIKI-CYUNUZI. The changes occured in the livelihoods of COOPRIKI's farmers due the financing received were analysed by a correlation analysis done between the financing received and seven (7) selected determinants of a livelihood of a small rural farmer, which are:

- Level of productivity/Season
- Level of investment in new assets/Year
- Level of education services/Year
- Level of health services/Year
- Level of producer savings/Season
- Level of diversified food consumption/Day
- Level of diversified investment in off-farm activities/Year

The results of the correlation analysis done between the financing received and selected rural farmer livelihood's determinants are presented in Table 4.

Sample size and correlation variables of the correlation analysis

- **Sample size (N):50**
- **Independent variable(Y) :**Financing received in COOPRIKI-CYUNUZI (Total funds received: Frw 1.192.602.940, average fund received per member: Frw 417.578).
- **Dependent variables(X):** Determinants of livelihoods:

X_1: Level of productivity/Season
X_2: Level of investment in new assets/Year
X_3: Level of education services/Year
X_4: Level of health services/YearX_5: Level of producer savings/Season
X_6 : Level of investment in off farm activities/Year
X_7: Level of diversified food consumption/Day
Y: X_1+ X_2+ **X_3**+ X_4+ X_5+ **X_6**+ X_7

Correlation's outputs/results

- **P-values: 0.00**
- **Critical value: 0.01**
- **Pearson's Correlation Coefficients:**

- Level of productivity/Season:0.682
- Level of investment in new assets/Year: 0.624
- Level of education services/Year: 0.589
- Level of health services/Year: 0.733
- Increased producer savings/Season: 0.663
- Level of investment in off farm activities/Year: 0.545

Interpretation of results

In the Table 4 the financing received in COOPRIKI-CYUNUZI and seven (7) determinants of livelihoods (X_1, X_2, X_3, X_4,X_5,X_6,X_7) of the cooperative's members have been correlated. Results are as follows:

For all determinants, all P-values (PV) are less than the critical value equal to 0.01(PVs<0.01).

That means that there is a positive relationship between the financing received in COOPRIKI-CYUNUZI and all the livelihoods' determinants (X_1 to X_7).

All Pearson's correlation coefficients (r) found for all determinants show a "moderate to strong" relationship between the financing received (Y) and determinants of livelihoods (X_1 to X_7):

- Level of productivity/Season: "r" equals to 0.682 indicates a positive moderate relationship between financing received and productivity.
- Level of investment in new assets/Year: "r" equals to 0.624 indicates a positive moderate relationship between financing received and investment in new assets.
- Level of education services/Year: "r" equals to 0.589 indicates a positive moderate relationship between financing received and education services.
- Level of health services/Year: "r" equals to 0.733 indicates a positive strong relationship between financing received and health services.
- Level of producer savings/Season: "r" equals to 0.663 indicates a positive moderate relationship between financing received and producer savings.
- Level of investment in off farm activities/Year: "r" equals to 0.545 indicates a positive moderate relationship between financing received and investment in off farm activities.
- Level of diversified food consumption/Day: "r" equals to 0.615 indicates a positive moderate relationship between financing received and diversified food consumption.

Conclusion on interpretation of the correlation results

The correlation analysis conducted between the financing received in COOPRIKI-CYUNUZI and selected determinants of livelihoods of the cooperative's members shows that the independent variable**Y** (financing received in COOPRIKI-CYUNUZI) is positively correlated with all dependent variables : X_1 to X_7 (selected determinants of livelihoods of COOPRIKI-CYUNUZI's members). In addition to that, P Values for all dependent variables are also less than the critical value for this analysis. Therefore, based on above findings, the total financing worth Frw 1,192,602,940 received in COOPRIKI-CYUNUZI in the period covering Season B 2014 to Season A 2016 have impacted positively the livelihoods of COOPRIKI-CYUNUZI's members considering positive changes that occured in all selected determinants of livelihoods of rural rice growers.

Analysis of the constraints faced by farmers in accessing finance for different needs along the value chain

The constraints to access formal financing in FIs come from both sides: (i) the demand side (farmers) and (2) the supply side (FIs).

Constraints expressed by the demand side

Primary production is the segment of the AVC where farmers need a lot of finance for diversified activities. In COOPRIKI-CYUNUZI, primary production is concerned by two sub-segments: (i) inputs acquisition and field operations. In section VI, results show that inputs acquisition received a lot of government subsidies and much loans compared to other segments of the chain, while Field operations financing is left to farmers, farmers received insignificant resources both from FIs and Government affiliated agencies. Figure 3 illustrates that field operations in COOPRIKI-CYUNUZI received less attention from FIs and from Government affiliated agencies.
Respondents revealed that small farmers encountered challenges for accessing formal credit in FIs to invest in rice farming activities, even if the fertilizers have been available. Some of the reasons include lack of adequate collaterals or guarantor, high interest rates, lack of bank information, lack of good business plans, etc.

Main constraints to access formal credit expressed by COOPRIKI's farmers were ranked on four-point scale:

- extremely high (4),
- high (3),
- high to some extent (2),
- high (1).

The scale was 4 to1 respectively. The constraints ranked were:

- Lack of collateral security
- Lack of guarantor,
- High interest rates,
- Lack of information of bank information.

The frequencies of main constraints expressed by farmers were weighed and sum of the ranking was established in the Table 5. Based on results presented in Table 5, respondents in COOPRIKI acknowledged that Lack of collateral security is the highest factor that constraint farmer access to credit with a total aggregated score of 172 points, followed by Lack of guarantor as the second factor with a rank score of 169 points. High interest rates is placed third with the rank score of 167 aggregated points, Lack of information and Lack of good business plan are both placed fourth as the last factor with aggregated rank score of 165 points.. This may be due to low level of educational of the members of the cooperative.

Constraints expressed by the supply side

Respondents coming from the FIs and support agencies which worked with COOPRIKI have been interviewed on constraints to access credit from the supply side (FIs). Six (6) main factors determining access to formal credit by farmers were identified and ranked on four-point scale:

- Extremely important factor determing access to credit (4),
- Important factor determing access to credit (3),
- Important factor determing access to credit to some extent (2),
- Not important factor determing access to credit (1)

The scale was (4) to (1) respectively. The determinants of access to formal credit selected were:

- Profitability of Investment
- Collaterals
- Interest rate
- Level of risk bearing
- Availability of Credit
- Loan transaction cost

The frequencies of determinants were weighed and sum of the ranking was established. It was discovered that the Profitability of Investment and Level of risk bearing were considered as extremely important factors and ranked first as the highest among other factors having an aggregate rank score of 19 points in the supply of agricultural credit. Collateral was placed second with total rank score of 18 points. The third place went to Interest rate with a total rank score of 15 points. Loan transaction cost a factor determining the supply of agricultural credit to farmers was placed in the fourth position having a total rank score of 14 points. Availability of credit was ranked fifth with a total rank score of 10.

Summary of the research findingson financing received in COOPRIKI-CYUNUZI and constraints faced by farmers inaccessing credit

COOPRIKI-CYUNUZI works in AVC model: the cooperative is linked to inputs suppliers and it supplies rice paddy to different rice milling companies. COOPRIKI-CYUNUZI started working with Financial Institutions at different levels of the rice production (UOB for inputs acquiition and paddy collection, SACCO Gatore for field opeations, Banque Populaire du Rwanda for field operations and Post-Harvest activities). The cooperative received technical and financial support from other stakeholders (Government and other development agencies: USADF-Rwanda, KWAMP, and RSSP).

COOPRIKI-CYUNUZI has received both financial support in forms of grants and Capacity building from Governement and developement agencies, and loans from few FIs:

- Funds provided by the Governement and developement agencies were higher than the formal credits received, and they only focused on inputs acquisition and Post-Harvest infrastructure.
- The financing provided by FIs to the cooperative is still insuffient to cover all the needs expressed by farmers during the primary production process, findings shown that during the paddy production process, the paddy takes 6 months to mature, and related field operations which required a lot of means are left to farmers themselves.
- Both farmers and FIs expressed that farmers encountered constraints to access formal credit, such as: lack of collaterals, lack of guarantor, high interest rates, lack of skills to develop banakble proposals, etc.

Farmers aknowledged that the financing received, even though insufficient, it has impacted positively their lives standards. They aknowledged that by engaging them in rice production and working with Fis, Governemeent and affiliated agencies to some extent, they have increased access to health services, education services for their children, have acquired new assets (cattle, goats, motocycle, have rehabilitated their houses, etc).

Key-recommendations to different agriculture value- chain stakeholders

To the policy makers/governments

Policy makers are recommended to enable a working environment for AVCF and provide directions to other stakeholders who are willing to promote the financial activity on value chain practices in order to strengthen the rural livelihoods. Some recommendations can be formulated as follows, the list is not exhaustive:

- *Support AVCF legislation*
- *Enhancing financial inclusion in AVCF*
- *Put in place mechanisms through which formal lending institutions can increase outreach in the rural areas*
- *Promote the cooperative mouvement for the purpose to regroup smallholder producers.*
- *Promote value chain models and value chain financing models development*
- *Build supportive alliances*
- *Contribute to risk mitigation*

To AVC facilitators: Donors/Agriculture Dvpt Agencies / Governments

From the guidance of policy makers, the government and other supporting agencies have to take their facilitation role and make sure that the financial system provides adequate finance to AVC actors that meet demands arising from activities along the value chain:

- *Build capacity of small producers and other chain actors towards clear separation of roles*
- *Enhance sustainable market linkages between small-scale producers and agribusinesses*
- *Promote promising VCF strategy and business model development*
- *Facilitate linkages between local financial institutions and leaders in value chains. Development*

To financial services providers (FIs)

As already seen, expanding access to finance to small producers enhance increase of productivity and yields, gross margins, creates employment in rural areas and causes the general economic growth,. Thus, adequate AVCF can impact positively the social conditions and rural producers 'livelihoods. Therefore, FIs have to play their role in promoting easy access to financial services by smallholder producers and other value chain actors. With adequate AVCF, producers are able to realize the full potential, get enough inputs, fertilizers and chemicals, labor for field operations, and hence, produce much for the markets. In this regard, the following actions can be undertaken by FIs. The list is not exhaustive:

Design Capacity Building and Training Curricula appropriate for AVCF: the following elements are to be considered

- ***Ensure that there is market demand for the crops****: loans should be made only for crops with reliable buyers that have already been contracted.*
- ***Create proper policies and procedures*** *to address some common AVCF risks when establishing the policies and procedures for value chain financing.*
- ***Assess real financing needs:****loan officers should use appropriate tools to evaluate the total cost of production and should also identify points along the value chain where providing access to finance could bring the greatest value to small producers and would represent a good investment for the institution.*
- ***Establish appropriate guarantees on individual loans*** *: such as group bonds and warehousing receipts, which should make it possible to lend to small farmers without requiring traditional forms of collateral.*
- ***Design financial products and repayment schedules that meet specific needs :*** *interest rates should be set to cover costs and provide a profit margin.*
- ***Distribute loans in vouchers:*** *those are suitable for the purchase of inputs from suppliers during different phases of the production cycle.*
- **Develop insurance products**against crop failure and weather-related risks.

- *Multiply financial products to meet needs*
- *Contribute to value chain strengthening*
- *Strengthen risk assessment and lending criteria*
- *Involvement of the financiers in risk mitigating measures*

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