Assessment of Effect of the Consortium Approach to Food Value Chain Development on the Production and Income of Smallholder Farmers in Tanzania

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ABSTRACT

This study assessed the effect of the consortium approach to food value chain development on the productivity and income of smallholder farmers vis-à-vis conventional approaches in Tanzania. The study was conducted in Mbarali district in Mbeya region and included smallholder paddy farmers and partners of Southern Highland Rice Consortium (SHIRCO) in the Competitive African Rice Initiative (CARI) project. Multi-stage purposive cluster sampling techniques were used to select 155 smallholder farmers and 17 key informants. Data were collected using open-ended questionnaires, key informant interviews, focus group discussion guides and documentation reviews and observation. Descriptive, inferential statistics (t-test), cost- benefit and SWOT analysis were employed.

Results revealed that mean farm size before and after the consortium were 1.36 hectares and 1.44 hectares respectively. Respondents' mean harvests per hectare before and after the consortium were 3.46 metric tonnes and 7.20 metric tonnes respectively. Male farmers mean harvest before and after the

consortium were 3.41 metric tonnes/hectare and 6.83 metric tonnes/hectare. Female farmers recorded 3.39 metric tonnes/hectare before and 7.29 metric tonnes/hectare after the consortium. Mean gross margins per acre before and after the consortium were US$228.09 and US$762.19 respectively, indicating a strong significance of P<0.0000** (P<0.05).

Climatic change conditions, especially drought, delays in loan processing and disbursement, delay in input supply and lack of gender-friendly labour-saving technology were constraints faced by farmers. The consortium approach improved output, productivity and the income of smallholder farmers. The approach has the capacity for scalability, replication and also potentials for sustainability.

Keywords: Smallholder farmers, Value chain, Consortium approach, Productivity, Income.

Introduction

Agriculture is an important driver and enabler of economic development in the East African Community (EAC) and accounts for about 80% of the workforce, involving smallholder farmers in rural areas. In spite of this, the EAC is characterised by low agricultural productivity and income, and is rated among the poorest in Africa (EAC Vision 2050, 2016). In Tanzania, agriculture accounts for more than a quarter of the GDP, employing 80% of the workforce and providing 85% of the country's exports, yet the country is one of the world's poorest countries. Four-fifths of the population is dependent on subsistence agriculture (WFP, 2016) and 67.7% of the population live in rural and semi-rural areas.

While the poverty rate has declined from 60% in 2007 to an estimated 47% in 2016, based on the US$1.90 per day global poverty line, the absolute number of the poor did not change, given the fast pace of population growth at over 3% per annum (World Bank, 2017). Mwatawala et al. (2016) indicated that poverty in Tanzania was more endemic among households engaged in crop farming, livestock keeping, fishing and forestry. Smallholder farmers are constrained by limitations of rain-fed and subsistence farming practices that leave them vulnerable to climate change, low knowledge of good

agricultural practices (GAP), poor access to efficient markets and lack of access to finance and biological, agrochemical and mechanical inputs, resulting in low productivity and income, and thus poverty.

Broadly, the study seeks to analyse the contributions of the consortium approach in the improvement of productivity and the income of smallholder farmers in rice value chains under the Competitive African Rice Initiative (CARI) project in Tanzania.

Specifically, the objectives of this study are to:

- determine the effect of the consortium approach vis-à-vis the conventional approach on the productivity and income of smallholder farmers,
- determine the critical success factors for the sustainability of the consortium approach,
- investigate the strengths, weaknesses, opportunities and threats of the consortium approach.

Value Chain Approach in Agriculture

The value chain approach is a viable vehicle for linking smallholder farmers with markets while improving productivity and income. The constraints smallholder farmers face can be improved through partnerships with other actors in production and in markets. Typically, a value chain describes the range of activities required to move a commodity from the first point along the chain which is production to the last point, which is consumption (FAO, 2015). A working definition of value chain offered by this study entails 'the interconnected activities and actors involved in the various phases of production, including underlying support services required to produce and move a product from producer to end-user.'

The cluster-based approach to value chain is a collection or networks of production populated by strongly interdependent firms (including specialized suppliers) within a value-adding production chain and service providers and associated institutions in a particular field (Theus and Zeng, 2012). The approach is built on the thinking that individual firms face constraints within the sector in which they operate and the solutions to these require the inputs of other firms in the sector. The approach is an

industry-based approach that focuses on the geographic concentration of interconnected companies and their interactions (Webber and Labaste, 2007). Based on its geographic focus, the cluster approach does not always focus on the entire value chain, but on supporting companies in specific locations (USAID, 2008).

Consortium Approach to Food Value Chain Development

The consortium approach is a collaborative and holistic approach built on a win-win partnership that focuses on closing the gaps of low productivity and income of smallholder farmers. The approach catalyses private sector investment, ensuring that smallholder farmers are integrated into value chains in a manner that ensure that their capacity is built on good agricultural practices, improved access to inputs, finance and market. The partners are smallholder (producers), input suppliers, off takers (lead firms/buyers) and service providers (banks, marketing, training and research institutions).

The Kilimo Trust adopts the consortium approach to value chain development (CAVCD) in implementing the Competitive African Rice Initiative (CARI) project in Tanzania, IFAD-funded Regional East Africa Community Trades in Staple (REACTS) project and other projects.

This study assessed farmers and partners in the Southern Highland Rice Consortium (SHIRCO), a rice value chain under the CARI project in Tanzania. SHIRCO was set up by the Kilimo Trust and partners with smallholder farmers, lead firm (Raphael Group Limited), input suppliers (Agriseeds Tech. Ltd-improved seeds; Yara Technology-fertilizer; Obo Investment Company Limited -pesticides/herbicides) and service providers (Ministry of Agriculture Training Institute - training and research; National Microfinance Bank – bank, and Khebandza Marketing Company - marketing firm).

Competitive African Rice Initiative (CARI) Project

The Competitive African Rice Initiative (CARI) project is a multi-donor funded project founded in 2014 by the Bill & Melinda Gates Foundation, BMZ and Walmart Foundation and implemented in East Africa (Tanzania) and West Africa (Nigeria, Ghana and Burkina Faso). The project is aimed at improving the livelihoods of smallholder rice farmers and

doubling their incomes. The CARI project builds on the optimization of sustainable business models that integrate small-scale rice producers with daily incomes below US$2, using the value chain approach. The CARI project provides matching grant funds to partners (CARI, 2016). The implementing agencies are GIZ (Nigeria), The Kilimo Trust (Tanzania), JAK-F (Ghana) and Technoserve (Burkina Faso).

Regional East Africa Community Trades in Staple (REACTS) Project

REACTS, formed in 2014, is an IFAD-funded, Kilimo Trust-implemented project in the EAC in Tanzania (Arusha), Uganda (West Nile Region, Northern region), Rwanda (Eastern region) and Kenya, with the main objective of assisting smallholder producers of key food commodities to 'farm as business' and increase income through regional trade. The project aimed to increase by 20% the income of at least 10,000 smallholders out of the 15,000 small-scale farmers targeted by IFAD projects in the EAC, while enhancing cross border markets, IFAD (2014).

Rice Production, Consumption, Import, Export and Market

Globally, rice is central to the food security of over half of the world's population. Rice is the fastest growing food source in Africa and the demand has been growing faster than anywhere else in the world in recent years, exceeding the sub-region's population growth.

Rice in Tanzania

Rice is both a staple crop for 75% and a cash crop for 80% of farming families. Tanzania is the leading rice producer in the EAC, accounting for 75% of rice production. Production increased from about 0.62 million metric tonnes in 1995 to 2.6 million metric tones in 2015 and is estimated at 3.4 million metric tonnes in 2016 (FAO RMM, 2017). Most (75%) of the average yield per hectare by smallholders is from rain-fed lowland ecosystems (FAO, 2015; Kilimo Trust, 2016) and yield varies greatly by ecosystem and variety used (Nkuba et al., 2016). Production in the lowland rain-fed ecosystem is prone to drought and floods while rice grown in the upland ecosystem is under dry land conditions and yields tend to be low.

Rice is the second highest consumed commodity after maize in Tanzania and the EAC. Per capita consumption shows that Tanzania consumes 25-30kg per person, Kenya 10-18kg, Uganda 5-7kg and 4kg each

in Rwanda and Burundi. The demand for rice in Tanzania is projected to triple by 2020, and a substantial deficit of 2.84 million metric tonnes is forecast in 2020 (FAO, 2015). Tanzania's National Bureau of Statistics forecasts consumption to triple by 2020, driven by rising urbanization, population growth and income.

Consumers prefer the aromatic long grain rice to the sticky white long grain rice and the brown rice. The two common varieties are:

(i) Mbeya region: Kyela rice (Kyela district) viewed as the best quality aromatic rice, followed by Mbeya rice (Mbarali district)

(ii) Morogoro rice viewed as semi-aromatic rice.

Dar es Salaam is the major end market for rice in Tanzania and accounts for about 60% of national consumption. Rice exports exceeded imports from 2009 to 2011, but were less than imports from 2012 to 2016. Tanzania's capacity to sustain an export surplus requires a 10% annual growth rate due to a rapidly growing domestic demand.

Theoretical and Empirical Issues

Several value chain approaches in food sub-sectors have been adopted in Tanzania and the EAC, but low productivity and low income of smallholders have prevailed. Few value chain approaches yield to collaborative models with documented empirical studies of the impact on productivity and the income of smallholders. The approaches operated were designed to solve problems in one or more phases in the chain, thus the methods in question work in isolation and find it hard to get all actors to buy in, making them less inclusive and sustainable.

Value chain collaboration is important to joint decision making (Schmitz, 1999), information sharing (Pooe et al., 2015), competitive advantage (Simatupang and Sridharan, 2002), cost reduction and revenue growth (Matopoulos et al., 2007).

A value chain approach can be used in the absence of a cluster approach, but value chains must be supported for a cluster approach to work. A cluster represents a specific segment of a value chain (USAID, 2008).

Table 1: Tanzania Rice Production, Consumption, Export and Import, 2007-2016

Year	Harvested Area ('000 Ha)	Yield Paddy (t/Ha)	Production		Consumption Milled Rice ('000 t)	Export		Import	
			Paddy ('000)	Milled Rice ('000 t)		Qty ('000t)	USD ('000)	Qty ('000 t)	USD ('000)
2016	1100	2.55	2800	1848	2018	40	2,765	260	721
2015	1000	2.7	2700	1782	1972	30	1,049	220	8,913
2014	925	2.83	2621.03	1730	1875	30	19,193	198	2,973
2013	928.27	2.36	2194.75	1463.9	1178.04	51.43	20003	284.79	128436
2012	799.36	2.25	1800.55	1200.97	1141.59	17.49	5427	197.52	94681
2011	1119.32	2.01	2248.32	1499.63	1053.97	35.18	12719	50.85	24227
2010	1136.29	2.33	2650.12	1767.63	1026.88	48.28	14348	74.88	33612
2009	805.63	1.66	1334.8	890.31	970.76	0.81	216	39.6	11161
2008	887.66	1.6	1420.57	947.52	1047.4	5.59	1648	64.19	16357
2007	557.98	2.4	1341.85	895.01	922.97	20.16	3974	48.45	6114

Source: IRRI World Rice Statistics Query Result, 2017 based on data from FAO, USDA. Aggregated by Author.

Conceptual Framework

The consortium approach is a collaborative approach, involving actors along all the nodes of the value chain, built on a win-win partnership (Figure 1).

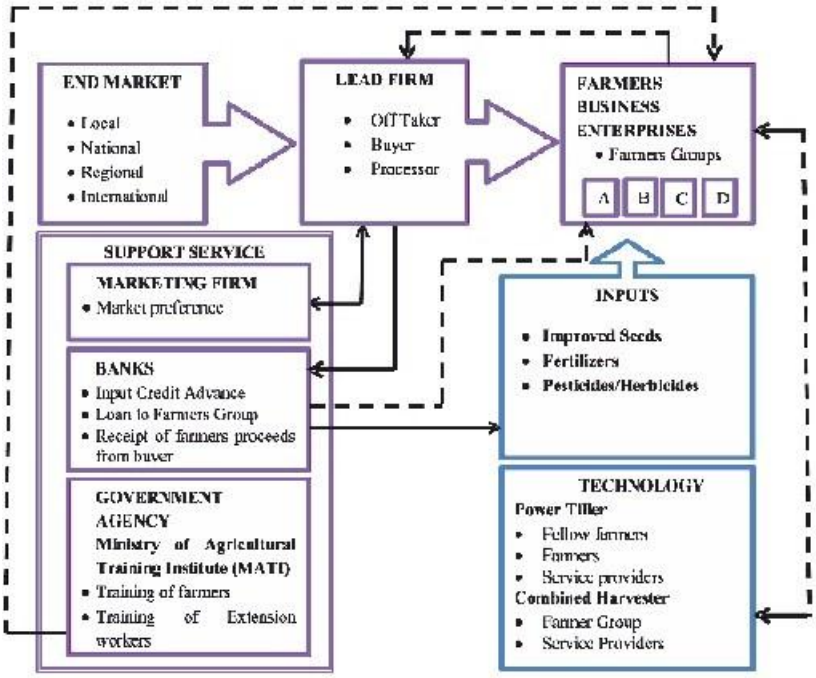

Figure 1: Conceptual Framework of the Consortium Approach to Food Value Chain Development

Source: Authors, 2017.

The lead firm (buyer) determines the training components, which are market-focused and the training institute (government institute) conducts the training for farmers and extension workers through demonstration plots, facilitation and pictorial representations. Farmers access power tillers and combined harvesters through hire and payments are in cash, either part payment or credit. The input varieties, especially improved seeds, are determined by the lead firm based on market preference. The consortium inputs suppliers deliver inputs to farmers' groups and the bank pays the suppliers through credit advance arrangements. The bank gets the refund

from farmers after sales to the lead firm, which pays farmers through the bank, where input credit and loan are deducted and the remainder is credited to farmers' accounts. Farmers access credit through farmers' groups.

Methodology

Study Area

The study was conducted in Mbarali district in Mbeya region located in the Southern Highland of Tanzania (SHT). Mbeya region is one of the ten benefitting regions of the CARI project in Tanzania. Agriculture contributes the most to the region's income. Mbarali district occupies the largest of the land area (16,632 sq. km dry land area (46.9%) and 0.1% sq. km water area) of Mbeya region's 35,954 sq. km. The population of Mbarali district was estimated at 329,132 and the district also has the largest proportion of irrigation schemes in Mbeya region.

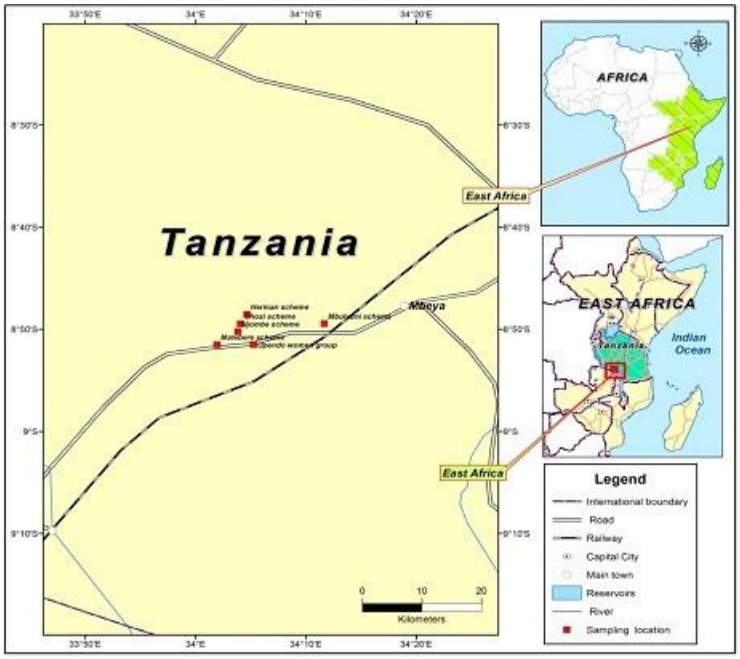

Figure 2: Area map showing the survey sites depicting farmers groups.

Source: Geographical Information System (GIS), Author (2017).

Research Design

The study employed the survey method. Data were collected through survey questionnaires, focus group discussions (FGD) and interview guides. Both primary and secondary data, covering quantitative and qualitative data were collected. SPSS IBM 20, MS Excel spreadsheet, cost-benefit and SWOT analyses were used to analyse data.

Study Population, Sampling Procedure and Sample Size Determination

The population for the study comprised 2,975 smallholder farmers, 2,011 males and 964 females, benefitting from the CARI project under the Southern Highland Rice Consortium (SHIRCO) in Mbarali district of Mbeya region. Multi-stage purposive cluster sampling techniques were employed. From the selection of the consortium to the districts used, purposive selection was used; while random selection was used to select wards, villages, farmer groups and respondents. The sample size was drawn from 2,975 smallholders, using a sample size calculator at statistical confidence level of 95 percent at an interval level of 1.96, resulting to 136. Excess provision of 19 smallholders was added, resulting in a sample size of 155 smallholders. Additionally, 17 key informants were purposively drawnfrom partner firms, the Kilimo Trust and community youths.

Method of Data Collection

The secondary data sources were from journals, newsletters, baseline surveys, reports, published research works and books. Primary data were collected from smallholder farmers in the SHIRCO consortium under the CARI project, randomly selected using pre-tested questionnaires, key informant interviews (KII), focus group discussion (FGD) guides and observation. Key informant interviews were conducted with partners in SHIRCO. Data were collected with the assistance of field enumerators trained in a pre-field exercise. FGDs were conducted in Chimala village with Matebete irrigation scheme farmers' and with motorcyclists (community youth), who are farmers but non-members of SHIRCO.

Analytical Methods and Techniques

The Statistical Package for Social Sciences (SPSS statistics IBM 20) and MS Excel spreadsheet were used to analyse data. The data were collated, verified, coded, cleaned and merged in data sheet. Qualitative and

quantitative data were presented in cross tabulation form, also with graphical and pictorial representations. Descriptive statistics (frequencies, percentages, mean and standard deviation), inferential statistics (t-test), cost-benefit and SWOT analyses were also used.

Experimental and Randomized Control Variable (RCV)

The study employed randomization to demonstrate a causal relationship between the consortium approach and the outcomes on the productivity and income of smallholders in the SHIRCO consortium. Farmers were randomly selected as experimental and control groups and the outcome of the consortium approach on their productivity and income were assessed.

Results and Discussion

Socio-economic characteristics of farmers in the SHIRCO Consortium

Gender

The results reveal that 66.5% of respondents were male and 33.5% were female. The study found that paddy production was more appealing to the women. Gender-friendly labour-saving technology will not only improve participation but will help to reduce workload, save time and enhance decision making and leisure. FAO (2017) indicated that technology can improve nutrition by increasing time available for women to take care of children and to prepare food.

Age

Respondents' ages showed that adults (66.5%) were than the youth (25.8%) and the elderly (7.7%). Enhancing access to market and addressing the constraints of finance, skills and technology will improve youth enrolment in agribusiness thereby boosting employment. Globally, 12 to 18 million youths enter the job market every year (IFAD, 2017).

Marital Status

The marital status of respondents shows that 82.6% were married, 9.0% were single, 5.8% were widowed, 1.9% were separated and 0.6% were divorced. Married farmers have the responsibility to cater for their families

and that drives them to leveraging on agriculture. Opara (2014) asserted that married farmers are likely to be under pressure to produce more for family consumption and they make use of family labour.

Educational Attainment

The majority of respondents had primary education (78.7%), followed by secondary education (16.8%), no formal education (1.9%), advanced level (1.3%) adult literacy (0.6%), and tertiary education (0.6%). Education enhances a farmer's ability to seek information and to utilize knowledge to avoid underusing or overusing inputs. Mwatawala et al. (2016) posited that the majority of farmers in developing countries who depend on agriculture have low levels of education.

Group Membership

Farmers in the consortium operate in groups known as a 'scheme' for better cooperation in the value chain and with the outcome of generating economies of scale. Group membership includes men, women and youth. Farmers' groups promote collective action and foster information sharing and learning. Groups attend farmers' field days and share experiences. Some farmers' groups have shown an indication of vertical growth; the Upendo Women Group established a subsidiary farmers group of 30 members for both men and women and is working toward owning a milling factory to sell milled rice to local and international markets. Similarly, the Mbuyuni irrigation scheme have plans to sell milled rice when their milling machine provided by government becomes operational. FAO (2014) posited that farmers' groups promote collective action, enabling individual farmers to reach urban, regional and international markets and to overcome the challenges of quality standards.

Main Planting Season and Source of Land

November to March is the main planting season for paddy in Mbarali district. The majority of the land used is self-owned (40.6%), followed by leased/borrowed (35.5%) and inherited (23.9%). Africa has the highest area of arable uncultivated land in the world (202 million hectares), yet most farms occupy less than 2 hectares.

Table 2: Socio-economic Characteristics of Respondents in SHIRCO Consortium

Variables (n=155)	Number of Respondents (Farmers)
Gender	
Male	103(66.5)
Female	52(33.5)
Age	
Youth	40(25.2)
Adult	103(66.0)
Elder	12(8.7)
Marital Status	
Single	14(9.0)
Married	128(82.6)
Divorced	1(0.6)
Separated	3(1.9)
Widow	9(5.8)
Educational Attainment	
No Formal	3(1.9)
Adult Literacy	1(0.6)
Primary	122(78.7)
Secondary	26(16.8)
Advance Level	2(1.3)
University/Tertiary	1(0.6)
Group Membership	
Mbuyuni Scheme	68(43.9)
Matebete Scheme	65(41.9)
Herman Scheme	13(8.4)
Upendo Women Group	4(2.6)
Chosi Scheme	3(1.9)
Njombe Scheme	2(1.3)
Source of Farm Land	
Self-owned	63(40.6)
Inherited	55(35.5)
Leased/Borrowed	37(23.9)

Effect of the Consortium Approach vis-à-vis Conventional Approaches on Productivity and Income of Smallholder Farmers Skills and Knowledge

The results reveal that before the consortium, few of the farmers received training in the different areas as opposed to after the consortium when the majority received training in all the areas (Figure 3). A comparison shows that only 7.7% of the respondents had training on good agricultural practices (GAP) before the consortium as against 96.1% after the consortium, while 7.4% received training on post-harvest handling (PHH) compared to 92.9%. The results show that training enhances smallholder farming as business and improves productivity.

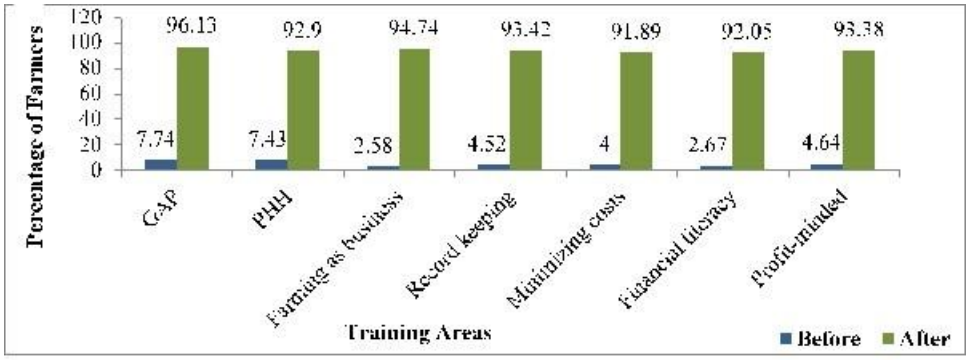

Figure 3: Training received by farmers before and after in the consortium.

Source: Field survey, 2017.

Production Inputs and Technology Accessed by Farmers

Before the consortium, 14.2% of respondents used improved seeds, 78.1% used fertilizers and 69.6% used pesticides/herbicides, while 85.8% used local paddy seeds. After the consortium, 97.4% used improved seeds, 99.4% used fertilizers and 100% used pesticides/herbicides. The majority of respondents used power tillers, combined harvesters and tarpaulins. Pallet, weighing scales and moisture metres were available in the warehouse.

Findings reveal that 91.4% of respondents received improved seeds, 99.4% received fertilizers and 100% received pesticides/herbicides from consortium input suppliers. Likewise 90.9% sourced for power tillers from fellow farmers, 1.3% from service providers, while 7.8% owned power

tillers. The majority of the respondents (96.9%) hired combined harvesters from farmers' groups while 0.6% sourced for tractors from service providers.

Table 3: Inputs and Technologies Accessed by Respondents in SHIRCO Consortium

Period	Improved Seeds	Fertilizers	Pesticides/ Herbicides	Plough/ Power Tiller	Tractor	Combine Harvester	Tarpaulins
Before	22(14.2)	121(78.1)	108(69.6)	65(41.9)	2(1.3)	36(23.2)	69(44.5)
After	151(97.4)	154(99.4)	155(100.0)	154(99.4)	2(1.3)	149(96.1)	139(89.6)

Source: Field survey, 2017.

Delivery Mechanism and Payment Modality in SHIRCO Consortium

Before the consortium, farmers bought inputs from shops, but after the consortium, 92.1% got improved seeds, 93.5% got fertilizers and 98.1% got pesticides/herbicides delivered by consortium input suppliers to farmers' groups. With the consortium, partner banks pay suppliers for inputs delivered to farmers and get refunds through the lead firm. The inputs credit enhanced farmers' access to inputs and suppliers' ability to turn credit into cash.

Warehouse Receipt System (WRS) in SHIRCO Consortium

The warehousing system in the consortium encouraged farmers to produce in bulk, take collective action and bargain as well as enhanced off uptake of paddy. Also, the consortium provides a warehouse receipt system (WRS), whereby farmers can access credit from the bank, using paddy stored in the warehouse as collateral, besides the availability of a buyer. Results reveal that the lead firm increased its storage capacity by building two additional warehouses, leveraging on the WRS with National Microfinance Bank.

Farmers Access to Finance in SHIRCO Consortium

After the consortium, 70.3% of respondents accessed bank credit. The loan facility ranged from TZS700000 (US$312.64) to TZS4000000 (US$1,786.51), disbursed instalmentally, mostly in 3 installments. Respondents indicated that the loans helped to increase production.

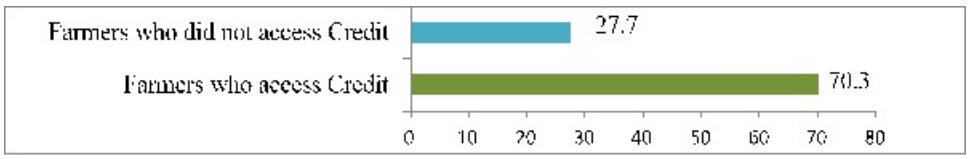

Figure 4: Farmers access to bank credit in SHIRCO consortium (%).

Source: Field survey, 2017.

Marketing of Paddy by Farmers in SHIRCO Consortium

Before the consortium, 51% sold to buyers who aggregated from individual farmers. After the consortium, 91.6% sold to the lead firm through group aggregation. The availability of a buyer in the consortium enabled farmers to have assured markets, which is helping to drive increased production and planning for expansion. The lead firm recorded increased supply of paddy from farmers that met premium price and market requirements.

Table 4: Forms of Marketing by Farmers Before and After in SHIRCO Consortium

Buyers	Before	After
Buyer picks from group aggregation centres	7(4.5)	142(91.6)
Buyer picks from individual farmers	79(51.0)	5(3.2)
Farmers sells to middlemen who takes to buyer	48(31.0)	7(4.5)
Individual buyer and middlemen	21(13.5)	1(0.7)

Source: Field survey, 2017.

Impact of Consortium Approach on Production, Mean Harvest and Land

Results reveal that before the consortium, respondents' outputs ranged from a minimum of 0.60MT per 0.20ha (5 bags on 0.5 acre) to a maximum of 26.40MT on 8.90ha (220 bags on 22 acres). Mean harvest per hectare was 3.46MT at 1.21MT standard deviation. After the consortium, minimum and maximum outputs were 1.56MT on 0.40ha (13 bags on 1 acre) and 79.20MT on 8.9ha (660 bags on 22 acres) respectively. Mean harvest per hectare was 7.20MT at 1.71MT standard deviation.

Production output and yield increased in the consortium and the changes were significant, indicating strong evidence as shown by P<0.0000**

(P<0.05). Total output of 720.60MT was realised on 211.55ha before the consortium, while 1,550.04MT was recorded on 222.98ha after the consortium, signifying a 749.98MT increase in yield.

The mean output per hectare before and after the consortium for male farmers were 3.41MT and 6.83MT respectively, while 3.39MT/ha and 7.29MT/ha were recorded by female farmers.

The mean harvest by age recorded by male farmers before the consortium revealed that the youth realised 3.39MT/ha, adults 3.42MT/ha and elders 3.37MT/ha. After the consortium, youth realised 6.91MT/ha, adults 6.69MT/ha and elders 7.89/ha. For female farmers, before the consortium, the youth recorded 4.08MT/ha, adults 3.21MT/ha and elders 2.92MT/ha. After the consortium, youth recorded a mean harvest of 7.65MT/ha, adults 7.24MT/ha and elders 5.56MT/ha.

Table 5: Effectiveness of Consortium on Production Output (Total, Gender, Age)

Period	Mean Production per ha by Gender (n=155)		Production Outputs (n=155)			
	Male n=103 MT	Female n=52 MT	Mean per ha MT	SD ha MT	Max. (8.90ha) MT	Min. (0.20 & 0.40ha) MT
Before	3.41	3.39	3.39	1.21	26.40	0.60
After	6.83	7.29	7.29	1.73	79.20	1.56
	Mean Production by Age (n=155)					
	Male n=103			Female (n=52)		
	Youth n=26 MT	Adult n=68 MT	Elder n=9 MT	Youth n=14 MT	Adult n=35 MT	Elder n=3 MT
Before	3.39	3.42	3.37	4.08	3.21	3.29
After	7.65	6.69	7.89	7.66	7.24	5.56

Ngailo et al. (2016) indicated that the average yield of smallholders in low altitude areas ranged between 1.6 and 2.4 tonnes/ha, while 5 to 6 tonnes/ha were recorded in irrigated schemes and 6 to 10 tonnes/ha were potential yields for lowland irrigated ecosystems in optimum conditions, depending on the varieties of rice grown and the level of management. The study found that 0.40 hectare (1 acre) is enough to pay for a loan, but not

sufficient for farming as business, thus farmers with 0.40ha or less can only be subsistence farmers.

Table 6: T-test Analysis of Difference between Mean Harvests recorded by Farmers Before and After in SHIRCO Consortium

t-Test: Two-Sample Assuming Unequal Variances		
	After MT/Ha	Before MT/Ha
Mean	7.205225806	3.467355
Variance	3.004788747	1.471975
Observations	155	155
Hypothesized Mean Difference	0	
Df	276	
t Stat	**21.99419372**	
P(T<=t) one-tail	6.17342E-63	
t Critical one-tail	**1.65039322**	
P(T<=t) two-tail	1.23468E-62	
t Critical two-tail	1.968596344	

Source: Field survey, 2017.

Women play an important role in the agriculture of developing countries, but are constrained by limited access to farm inputs, credits, extension services and labour-saving technology. Empowering women is critical to poverty reduction and provides women the opportunity to expand their capacities to live the kind of life they have reason to value, offers the ability to make choices on economic activities and participate in the governance process.

Case Study of Mary Kayanda in SHIRCO Consortium, Mbarali District

Mary Kayanda, a farmer, had lived in her old mud house since 1992 (about 16 years as at 2017). As a result of the consortium, her farm size moved from 0.40ha to 1.21ha (1 acre to 3 acres) and now 2.43ha (6 acres). The knowledge of GAP, PHH and farming as business helped to increase her yield and production as well as income.Mary joined SHIRCO consortium in 2015 and commenced the building of her new home in 2017.

Mary and her husband being interviewed by researcher; Emmanuel Ejewule

Agribusiness Empowerment: Case Study of Maria Nyoni, Treasurer of Upendo Women Group, Mbeya, Tanzania

Maria, a farmer, is a 30-year old married lady with a child. Her husband is also a farmer. Maria is the treasurer of Upendo Women Group, one of the Schemes in SHIRCO under the CARI project in Tanzania. She relocated to Chimala in Mbarali district in Mbeya region due to lack of means of livelihood and need for empowerment. Maria joined Upendo Women Group in Chimala. The group joined SHIRCO in 2013. In the course of practicing agriculture, Maria met Mr. Twalibu, a farmer and both of them found love and got married in 2013.

Before joining SHIRCO, Maria cultivated 0.20ha with output of 0.72MT of paddy. After her group joined SHIRCO, her farmland increased from 0.5 to currently 2.02ha in line with the decision of the group. Her yield increase from 0.72MT per 0.20ha to 3.60MT and 4.20MT per 0.20ha, representing increases of 400% - 483%. Young Maria is supporting the welfare of the family through improved food security and education of their child. In addition, she has opened a catering business. She acquired land for building her own house and the building has commenced.

Costs-Benefits Analysis of SHIRCO Consortium

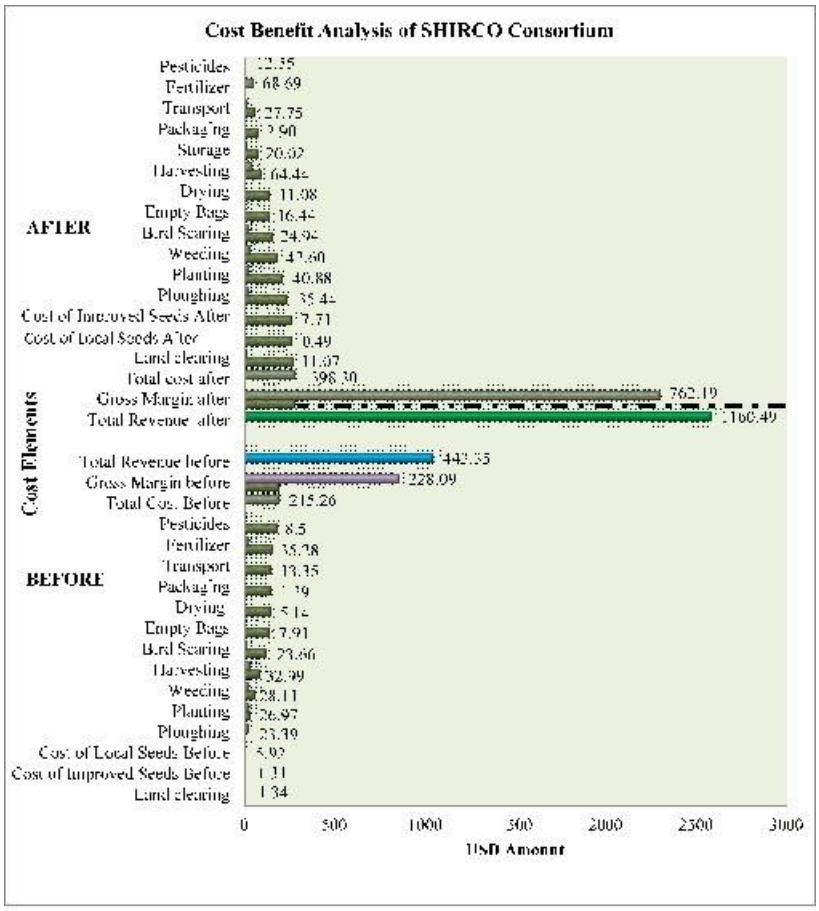

Figure 5: Cost- Benefits Analysis of SHIRCO Consortium for Paddy Per Acre

Source: Field survey, 2017.

Before the consortium, respondents attributed low production outputs to financial constraints, inadequate knowledge of GAP and PHH, low access to farm inputs and market constraints. The analysis revealed that respondents recorded mean gross margins of $228 and $762 per acre before and after the consortium respectively, indicating a significant change. However, the increase in production and income come with incremental costs reflected in purchase of improved seeds, fertilizers, herbicides and use of power tiller and combined harvester.

Critical Success Factors for Sustainability of Consortium Approach

The consortium is underpinned by success factors such as commercialization of smallholder farmers by the adoption of farming as business, assured market, market orientation, collective action and inputs access. The warehousing enhances PHH, marketing and inputs delivery and paddy aggregation.

Table 7: Key Attributes/Success Factor of Conventional Approach (Before) and Consortium Approach (After) in Food Value Chain Development

Attributes	Conventional Approach (Before)	Consortium Approach (After)
Business focus	Support and risk management intervention	Commercialization of smallholder farmers
Orientation	Win-Lose (zero sum game)	Win-Win
Organization	Fragmented, less integrative	Integrative/Inclusive
Participants	Actors in some of the nodes	Actors in the entire nodes
Commitment	Public sector-dependent	Pushes for private sector ownership & commitment
Transaction Terms	Short-term transactions (individually)	Long-term transactions (group)
Market Decision	Made on personal bargaining	Made on joint-decision
Focus	Supply-driven	Demand-driven
Coordination	Limited	Strong
Improvement	Unilateral initiatives	Continuous joint activities
Interest	Act only in own interest	Act for mutual benefits

Source: Field survey, 2017.

Strengths, Weaknesses, Opportunities and Threats of the Consortium Approach in Improving Productivity and Income of Smallholder Farmers in SHIRCO Consortium

The SWOT analysis revealed that SHIRCO consortium is underpinned by some strength. However, in opposition to these strengths are some weaknesses. Nonetheless, there are opportunities to spur growth once threats can be mitigated.

Table 8: SWOT Analysis of SHIRCO Consortium in Mbarali District, Mbeya Region, Tanzania

STRENGTHS	WEAKNESSES
1. **Private sector ownership and commitment:** the buyer, inputs suppliers, bank and marketing firm are private sector firms. 2. **Market orientation, assured market and demand driven:** the inclusion of buyer provides assured market. 3. **Farming as business:** commercialization of smallholders as farming business. 4. **Collective action:** joint cooperation, mutual benefit. Partners share business opportunities available outside the consortium among themselves. Farmers groups enhance integration rather than competition for a common buyer.	1. **Donor-driven:** the approach is donor dependent. 2. **Long loan processing:** time lag in loan processing and disbursement by bank, leading to delay in inputs delivery. 3. **Lack of gender-friendly labour saving technology:** power tiller used for plough is energy sapping, and operated by male youth and adults. 4. **Trust issues:** some farmers prefer selling paddy to buyers who offer higher prices.
OPPORTUNITIES	**THREATS**
1. **Replication potentials and attractiveness to financial institutions and input suppliers:** changes in global agrifood system push for collaborative value chain approach. 2. **Demographic development:** growing local demand for aromatic long grain rice and population growth. 3. **Intra-Africa and regional trade:** there is a buoyant market in Africa and in the EAC rice subsector. In 2017, Inter-Africa trade was only 13%.	1. **Climatic change condition:** drought, flood, shortage of rainfall and adverse weather. 2. **Politic of food:** unexpected policies that make it difficult to plan investment along range of time, e.g. export ban. 3. **Market dynamics:** smuggling of imported rice, make local rice costly. Price fluctuation is also a factor. **4. Risk of depending on single buyer**

Challenges Respondents Faced in Paddy Farming in the SHIRCO Consortium

The challenges respondents faced in the consortium include:

i. Delay in delivery of inputs by input suppliers attributed to delay in loan processing;
ii. Delay in loan processing and disbursement as well as double-digit interest rate;
iii. Conflicts between herders (Sukuma and Maasai tribe) and farmers on gazing areas and water management;
iv. Conflict of road demarcation for passage of combined harvester between farms;
v. Climate change conditions (drought);
vi. Bottlenecks in accessing foundation seeds from government by improved seed suppliers;
vii. Time lag in shipment of fertilizer to Tanzania to be accessed by input suppliers;
viii. Working capital need for lead firm and farmers.

Conclusion and Recommendations

Conclusion

Largely, the consortium approach has been effective in increasing the productivity and income of smallholder farmers as well as the sales and incomes of buyers and inputs suppliers. The lessons learnt from the project should be applied to strengthen the value chain and scale up the consortium approach in Tanzania, the EAC and Africa. The commitment of partners and results recorded show evidence of sustainability and would be better appreciated after 1-3 years of exit from the CARI project, when post monitoring and evaluation are conducted to ascertain the sustainability of post-impact of the consortium. The consortium intervened in the area of training, access to inputs, credit, delivery mechanism, payment modality and market. A collaborative value chain that yields to a win-win partnership is relevant as a model in value chain development. Value chain approaches vary with the problem to be addressed, the way they are applied and the actors involved. No approach is foolproof from challenges. The challenges

facing the consortium should be addressed. The consortium approach can be a tool that offers a way out of poverty, improves food security and enhances growth.

Recommendations

The study recommends that the approach should be extended to other farmers, crops and regions. The CARI project should have a phase II, to consolidate on the gains recorded and address constraints identified, ensuring that partnership is not a zero-sum game, but a win-win relationship that ensures smallholders are well integrated to the extent that everyone in the chain wins.

Farmers

Individual farmers should cultivate a minimum area of more than 0.40ha (1 acre) to achieve the status of farming as business. There should be better schedules of water management and proper demarcation of boundaries to reduce conflicts. Measures should be adopted to minimize water contamination with agrochemicals and associated health risks. Farmers should consider the cost-effective option of hiring a truck to transport inputs or get delivery by input suppliers. Farmers' groups should pool paddy together to take advantage of the warehouse receipt system.

Inputs Suppliers

Inputs suppliers ensure timely delivery of inputs to farmers. Provide input credits to farmers and get refunds from the bank. Farmers should be given trade discounts for bulk purchases. Farmers should be trained on better application of inputs to ensure timeliness, ease and frequency. Inputs suppliers should work with other actors to mitigate climate change effects in line with climate-smart agriculture.

Bank

The bank should ensure timely processing and disbursement of loans to farmers and provide concessionary interest rates to farmers. The bank could liaise with the Bank of Tanzania to provide one-digit interest rate in line with the growth enhancement of micro, small and medium enterprise programmes. Corporate social responsibility should be extended to SHIRCO farmers' communities. The bank could also provide equipment loan facilities for the acquisition of gender-friendly labour-saving technology. It can provide promotional advertisement to the best performing farmers as brand ambassadors and support the Upendo Women Group with credit to acquire a milling machine.

Lead Firm

The lead firm attracts more banks to partner with the consortium. It should replicate this approach to other farmers, regions and crops and set up a monitoring and evaluation framework integrated with gender specialists in line with a sustainability plan. It should also institute a revolving fund to provide for training needs, coordination and internal financing to enhance the input credit needs of farmers. The lead firm should adopt modern equipment for drying of paddy, as against tarpaulin, and improve on product standardization and promotion while ensuring that price negotiations with farmers reflect market reality and improve partners' joint planning. The lead firm should work with CARI project to ensure gradual exit of the project.

Government of Tanzania

The government of Tanzania (GOT) should benchmark policy impacts by weighing the impacts on rural areas, especially on smallholders. Politics of food should not be detrimental to commercialising smallholders. Government should increase institutional strength and citizens' enlightenment in tackling the problem of rice smuggling into the country. It should develop PPP on agricultural insurance and promote crop and rain insurance for smallholders to mitigate climate change effects (DRT, 2012).

Government should work with the EAC partner states to operationalise the EAC Climate Change Fund to leverage on the Green Climate Fund and other climate finance mechanisms to mitigate climate change effects. It should improve infrastructure (irrigation, canals, roads) and provide alternative water sources (down water). Infrastructure should prioritise linking smallholders to market so as to close gaps of low productivity (SID, 2016). Government should provide gender-friendly labour-saving technology and interventions that increase participation and reduce workload, especially for women and youth.

Weather forecasting infrastructure should be provided to help disseminate two-way information to farmers to strengthen resilience to climate change. Finally government should provide targeted credits for MSMEs agribusiness at one-digit interest rate.

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