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Elaborating institutional arrangements to better enhance sustainable crop intensification in Uganda: A farmers' perspective

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ABSTRACT

Weak and inefficient institutional arrangements have been identified as a major cause of the slow pace of agricultural growth in developing countries. Institutions – the humanly devised constraints that shape human interaction – play a significant role in Sustainable Crop Intensification (SCI) in Uganda. This study uses farmers' perceptions to assess institutions and their roles in SCI. We collected data from 135 rice and potato-producing households in Eastern and Southwestern regions of Uganda between January and February 2017. We used Focus Group Discussions to identify and categorize institutional typologies following which we asked households to evaluate several institutional aspects. Overall, institutional contributions to SCI were highly valued by farmers. Based on functional, organizational, and managerial obstacles, farmers perceived formal institutions to be ineffective while they perceived informal farmer's institutions to be the most relevant institutions as they provided financial resources that alleviated constraints to agricultural production and met livelihood needs. We found a lack of coordination between the micro, meso, and macro-level institutions, which then affected their institutional functionality to execute SCI. There is a need for innovation within existing institutions, and a status quo of institutional arrangements that would better respond to smallholders' needs.

1. Introduction

Agriculture in sub-Saharan African countries has trailed behind global food systems (Bjornlund et al., 2020). Its performance in terms of production and food security in the region has remained poor (Bjornlund et al., 2022). Although agricultural productivity in SSA has recovered strongly from the stagnation of previous decades, additional effort is required as the region remains the most food insecure in the world (Badiane et al., 2021). Further, much of the world's marginal population increase of 1 billion people (from 7 to 8 billion people, by mid-November 2022), is concentrated in SSA (Zeifman et al., 2022). This has resulted in increased calls for sustainable agricultural systems amidst concerns that Africa cannot feed itself.

Low use of inorganic fertilizer and agrochemicals in SSA is widespread except on specific crops and in countries that implement subsidies (Sheahan and Barrett, 2017). Smallholder farmer behavioral choice of unsustainable paths is partly due to policy reforms implemented over past decades, which affect price distribution, transaction costs and hence lead to a capital-constrained environment in which smallholders operate (Bjornlund et al., 2020). Sheahan and Barrett (2017:23) emphasize the critical importance of catering for the policy and institutional environment as well as biophysical realities 'to usher a green revolution in SSA'. Institutions - the humanly devised constraints that shape human interaction (North 1990 as cited by Faundez, 2016) prohibit or permit actions that reduce transaction costs, improve information flows, and enforce property rights (Premarathne, 2011).

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It is critical to understand long-term historical issues that affect institutions in Uganda and the way they facilitate or constrain agricultural change. The unitary decentralization policy of Uganda, according to Weylandt (2013), was designed for maximum participation. It was implemented under the Local Government act of 1997 (LGA) (Ministry of Local Government, 1997), to enable control over services within proximity to the population. However, the political and administrative features of the decentralized system in Uganda often transcend fiscal aspects, which are not equally matched with adequate financial resources to effectively deliver services (Bashaasha et al., 2011; Green, 2008). Local governments are also unable to attract and retain sufficiently trained and experienced staff. Consequently, as Okoboi et al. (2011) elaborate, inefficiencies within governmental and non-governmental institutions in agricultural service delivery programs have stagnated Uganda's agricultural development.

According to (Estrin and Prevezer, 2011), informal rules have long been of interest but have not been rigorously conceptualized into mainstream studies of institutions that have focused on the rules of the game. Yami and van Asten (2018) establish that informal institutions in Uganda facilitate access to land and financial resources but are unaccompanied with mechanisms to support investment in Sustainable Crop Intensification (SCI) interventions. Furthermore, they observe a gap in knowledge of the interaction between formal and informal institutions. In this study, we use Vanlauwe et al.'s (2014) definition of SCI which entails increasing production of available farmland while minimizing the pressure on soil without jeopardizing production capacities in the future.

This study focuses on aspects of the interrelationship between formal and informal institutions in Uganda. We define formal institutions as codified laws, which govern governments, co-operatives, firms, communities, which members follow (Hodgson, 2006). They include state-enforced rules such as constitutions, laws, and regulations (Estrin and Prevezer, 2011). Informal institutions are socially defined codes of conduct transmitted through and by communities (Rahman et al., 2012). Understanding of the interactions between formal and informal institutions enables us to characterize their interplay in the contribution to sustainable crop intensification.

We specifically delve into an understanding of institutional arrangements. Limited literature converges the status of institutional arrangements and support required to ensure service provision in Ugandan potato and rice cropping systems. We describe institutional arrangements as locally efficient ways of coping with risk and transaction costs under given production conditions (Binswanger and McIntyre, 1987). We specifically determine what interactions occur within institutional arrangements and how formal and informal institutions integrate across (Macro, Meso, and micro) scale.

2. Conceptual framework

2.1. Institutional arrangements required to improve service delivery to smallholders

In SSA, government attempts to improve service provision through community-level support have evolved over the last two decades. Despite government decentralization reforms implemented during this period, evidence shows poor support for decentralization. Both unitary centralized alternatives and their federal decentralized siblings of government have failed citizens (Erk, 2014) in the sense that 'deficiencies at the centre cause the locals to suffer' (Lewis, 2014). Challenges of decentralization have been widely discussed (see UN Economic Commission for Africa, 2017; Erk, 2014; Dafflon, 2013; Weylandt, 2013; Adamolekun, 1991). One uncommonly reported hindrance to the efficacy of decentralization is ignorance of institutional endogeneity characterized by a lack of understanding of the uncoded background conditions, which limits understanding of decentralized governments and their causal role in the outcomes of decentralization (Wibbels,

2006). As elaborated by Premarathne (2011: 42), 'developing countries introduced formal institutions without consideration to the importance of informal institutions in agricultural development hence varying growth rates of agricultural development'.

Analyses of literature on the relationships between formal and informal institutions suggest advances in the collaborative interplay among actors within and among different spheres. This literature emphasizes decision-making processes that exert influence within formal and informal relationships (see Farrell and Héritier, 2003; Vandersypen et al., 2007; Yami et al., 2009, Saint Ville, Hickey, and Phillip, 2017). Based on a study on bottlenecks for SCI in Burundi, Rwanda, and eastern DR Congo, Schut et al. (2016:165) ascertain those institutional innovations that focus on better access to credit, services, inputs, and markets are required to address most SCI constraints in Central Africa. Yami and van Asten (2018) further established that informal institutions are influential to farmers' adoption of SCI practices in Uganda. Such significance of informal institutions in Uganda suggests the existence of a less developed formal institutional architecture, where informal institutions play an active role in reducing transaction costs (Premarathne, 2011). On the other hand, a plethora of agricultural innovation systems research emerged, to address technological, organizational, institutional, and other constraints to agricultural development using institutional arrangements to strengthen stakeholders' capacity to innovate (Schut et al., 2015; Leeuwis et al., 2014).

Smallholders are central to food production in SSA through numbers engaged and quantities produced. They are, however, widely dispersed, unorganized, and often diverse as societies. This situation exacerbates the ability to institutionalize smallholder systems. Yet as Pretty (1997) notes, farmer participation is essential to the adaptation, translation, and operationalization of the SCI concept to fit their local context. Institutional dynamics are also increasingly complex stemming from differing perceptions at the individual, household, and institutional level. For example, smallholder households in Uganda view the use of modern inputs as a risky investment (van Campenhout and Bizimungu, 2018). Intra-household intricacies show differences in adoption of SCI practices among male and female plot managers in the same household in Kenya (Ndiratu et al., 2014), implying gender based differing levels of intra-household requirements for information, knowledge, markets, and services. Beyond the farm level, scaling services require different degrees of engagement with public and private catalysts to enable access to finance, diffusion of agricultural knowledge to farmers, and access to markets (Pretty et al., 2011). Once integrated in tandem over time, these prime movers permit the construction of a system of interactive development institutions to ultimately increase sustainable production (Rukuni, 2002). Furthermore, technology-learning processes require specific capacities to absorb existing technologies including a national agricultural innovation system, human capital, and infrastructure (Bell and Pavitt, 1992). These processes render institutional change as contextual, complex, and often long-term and unpredictable (Skoog, 2005:6).

2.2. Conceptualizing institutional arrangements in smallholder cropping systems

Premarathne (2011) and Eaton et al. (2007) (Fig. 1) present conceptual frameworks that integrate formal and informal institutions in the agricultural sector. Premarathne (2011) considers the operationalization of institutions within a broader agrarian development context. This context views the agricultural landscape as an economic institution where farmers operate under formal and informal institutional arrangements to attempt to reduce their transaction costs associated with production and marketing decisions. In such a context, input markets including fertilizer markets could be plagued by risk, seasonal demand, high transport costs, underdeveloped financial services, cash-constrained farmers, and limited economies of scale, which exacerbate the role of private market conditions in rural Africa, and

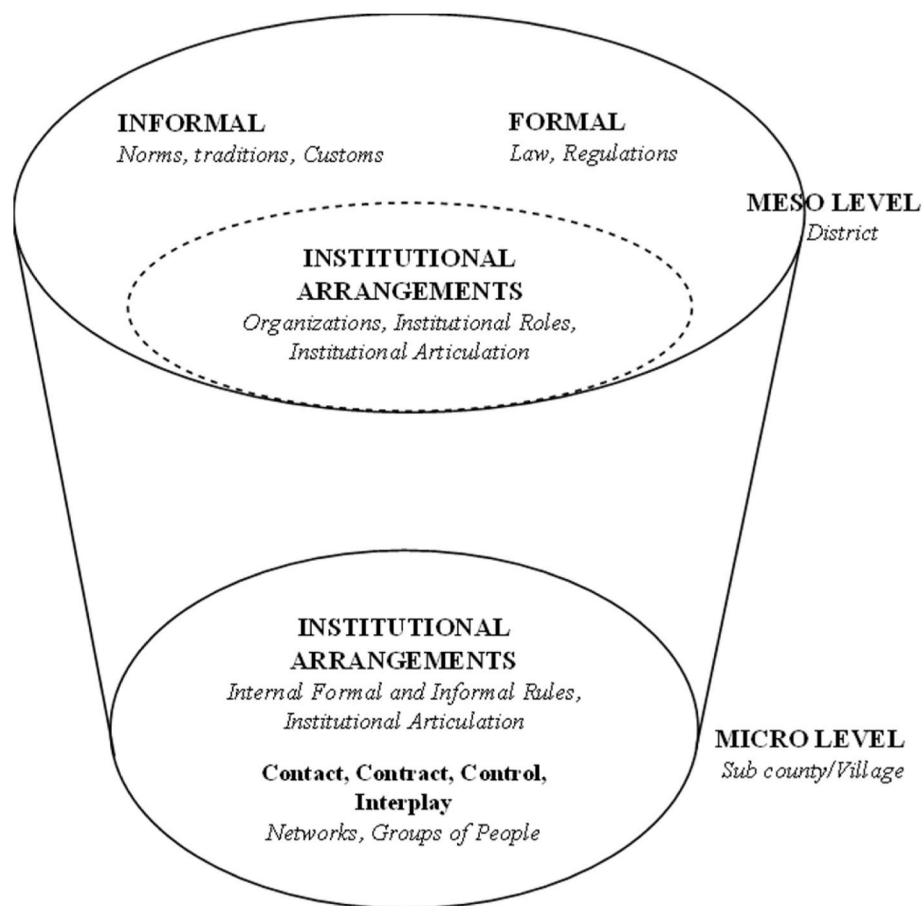


Fig. 1. Differential levels and components of institutions. Adapted from (Eaton et al., 2007).

necessitates government support in the short and medium-term (Reardon et al., 1999). While acknowledging this wider development context but considering the need for specificity, we adopt the framework by Eaton et al. (2008) (Fig. 1) which focuses specifically on institutional arrangements emanating from formal and informal rules that converge organizations, their institutional roles, and contractual agreements. At an internal level, the institutional arrangements converge further under internal rules and regulations that govern their contact, contract, and control.

Literature often uses the concepts of organization and institution interchangeably. However, several authors attempt to demarcate the distinction between organizations and institutions. The International Fund for Agricultural Development (IFAD), distinguished institutions as a manifestation of organizations (IFAD, 2003). describes institutions as “the economic, social and political organizations, together with the rules that govern their interaction” while the World Development Report (World Bank, 2003) describes institutions as the rules, organization and social norms that facilitate the coordination of human action. Khalil, (1995) notes that the concepts should be used in a complementary manner because organizations describe “an end” – agents like households, firms, and states that have preferences and objectives, while institutions are “the means to an end” – the formal and informal constraints (e.g., rules, habits, constituents, laws, and conventions) which reduce the total scarce resources available. Reference to the concept of the institution without reference to the organization or the presentation of an organization as one type of institution presents two problems: the problem of the behavior of the organization as dictated by institutions and secondly, it neglects the issues of division of labor and how the intra organizational relations cannot be fully explained by only examining underpinning institutions (Khalil, 1995).

This elaboration of the two concepts implies that organizations are shaped by institutions, which in turn shape institutional change. We also ascertain that different organizations play distinct roles within institutional arrangements to alleviate institutional challenges. For example, based on functionality, organizations are categorized as market, civil, and public institutions (Agrawal, 2008; IFAD, 2008; World Bank, 2003). Economic institutions for example are also termed market institutions (Fadiran, 2015), they provide security of property rights while political (formal) organizations are elected government units tasked with the protection of property rights and maintaining rule of law (Angeles, 2011; Hyden et al., 2003). As groups, memberships, and relations that are not managed or controlled by the government (World Bank, 2003), civil institutions impact national and local policies and regulations to increase their bargaining power and access to economic opportunities (IFAD, 2003).

The collective action of different institutions towards development is also termed “Institutional Articulation” which describes the nature and extent of linkage and interaction of institutions in each territory (Agrawal, 2008). Associated studies in this arena have elaborated on the degree of integration between these institutions, while others depicted the type of interplay. (Jiren et al., 2021), for example, found that there was a decline in informal institutions due to changes that were enforced by formal institutions as the latter partly contradicted the interventions and aims that were previously encouraged by the informal institutions. On the other hand, a study in India determined that although several formal and informal institutions existed in west Bengal, they were ineffective in promoting Sustainable Agricultural Intensification because these institutional initiatives were programmatically linked and operated in silos (Ratna Reddy, Chiranjeevi and Syme, 2020).

3. Materials and methods

3.1. Study area

The study setting is based in Uganda, found in Eastern Africa. Food production has tripled in Uganda since independence in 1962, with five times the population growth occurring during the same period (Leliveld et al., 2013). Coupled with land degradation and climate change, the increasing population poses a food security challenge. One-third of the population experienced acute food insecurity in 2016 due to recurrent El Niño events (The Office of the Prime Minister (OPM), 2017).

The study was conducted in Butaleja and Kabale districts based in eastern and southwestern Uganda respectively (Table 1 and Fig. 2²). These districts have an average population density of 344 persons/Km² which is on average about six times the world population density (61 persons/Km², (Ritchie and Mathieu, 2019).

The eastern and southwestern regions of Uganda are also the leading producers of rice and potato, respectively. Rice and Potato are model crops for agricultural intensification due to their high potential to contribute to household incomes and food and nutrition security in Uganda (Bonabana-Wabbi et al., 2013; MAAIF, 2009). The two crops also have a high potential for intensification given the enabling institutional environment. These include research institutes (E.g., Butaleja and Kachwekano Zonal Agricultural Research and Development Institutes), a government scheme to promote intensification (Doho Irrigation Scheme Farmers' Cooperative Society (DIFACOS), the Uganda Industrial Research Institute (UIRI) in Kabale and other value chain organizations.

Water bodies including wetlands in Eastern Uganda provide an enabling environment for lowland rice production. Eastern Uganda produces 57% of Uganda's paddy rice, with 90% comprising lowland rice (Kijima, 2014). Extensive lowland rice production led to between 40 and 60% of wetlands loss in eastern Uganda (Oonyu, 2011). Southwestern Uganda's high altitude favors potato cultivation where the region produces 87% of potato in Uganda (Bonabana-Wabbi et al., 2013); Kabale is the second highest producer of potato. Farm sizes under rice

production in eastern Uganda average 0.4 ha while land sizes allocated to potato production in western Uganda average 0.11 ha, with yields of 3.6 t/ha and 5.2 t/ha respectively (Uganda Bureau of Statistics, 2010a).

A baseline survey (van Campenhout et al., 2014) conducted in the southwestern and eastern Uganda found that Potato farmers mostly owned the plots on which they farm while rice farmers primarily owned land but also rented in land for rice production. The study found that seventy percent of the sample also reported that land had never been left under fallow. Rice farmers used improved seed more and only less than 9% of the potato farmers use improved seed however, potato farmers used fertilizers (both organic and inorganic) on their plots (Ibid). However, challenges to potato production include pests and diseases attributed to poor seed quality (Namugga et al., 2017).

3.2. Data sources and sampling techniques

The study used both primary and secondary data. Secondary data (annual reports, and scientific articles, etc.) established background information, determined the role, and conducted an initial categorization of organizations. Semi structured interview tools were used to collect primary data. Following the desk review, Focus Group Discussions (FGD) were conducted with forty respondents. Twenty-two respondents (10 females) from Butaleja and 18 respondents (10 female) from Kabale categorized 11 common types of organizations that supported SCI at the district level after which their contribution, influence, timeliness in service provision, and sustainability of services that these organizations provided were discussed. Farm households were interviewed to establish the perceptions of collaborative roles played, services provided, challenges and opportunities organizations face, and consequent outcomes of service provision in a semi structure interview.

Mazimasa and Kachonga sub-counties from Butaleja district and Kamuganguzi and Muko sub-counties from Kabale district were purposively selected as study sub-counties that produced relatively higher rice or potato respectively and availability of support organizations within the sub-county. There are 6200 and 4401 households in Mazimasa and Kachonga sub-counties and 4488 and 10,258 households for Kamuganguzi and Muko sub-counties, respectively. The sample size was computed using the Krejcie and Morgan (1970) sampling formula (Equation (1)).

$$S = \frac{x^2 NP(1-p)}{d^2(N-1) + x^2 p(1-p)} \quad (1)$$

Where:

S = Sample size.

X² = the table value of chi-square for 1 degree of freedom at 90% confidence level (1.645*1.645 = 2.706).

N = the population size.

P = the population proportion (assumed to be 0.5 since this would provide the maximum sample size).

D = the degree of accuracy expressed as a proportion (0.1).

The application of this formula (Equation (1)) produced a proportional sample of 68 and 67 respondents from Kabale and Butaleja, respectively to ideally match the available (restricted) finances and efforts required to implement the study. At the sub-county level, a sample proportional to the sub county population size was also selected. Systematic random sampling was applied to select 21 and 47 respondents from Kamuganguzi and Muko sub-counties in Kabale district and 39 and 28 from Mazimasa and Kachonga sub-counties respectively in Butaleja district. The latter sampling technique was used to minimize chances of potential bias because of selecting respondents at a fixed interval away from another and hence risk of error when selecting individual respondents from the sample.

Table 1

Characteristics of study districts.

Characteristic of Study area	National	Butaleja	Kabale
Population in 2014 (Uganda Bureau of Statistics, 2016)			
Total population	34,634,650	244,153	528,231
Males	17,060,832	119,721	254,414
Females	17,573,818	124,432	273,817
Population density	173	373	314
Population growth (2002–2014)	3	3.7	1.2
Households			
Number of households	7,305,887	44,376	117,854
Average household size	4.7	5.5	4.4
Land Cover in 2015 (hectares) (Uganda Bureau of Statistics, 2005)			
Wetland	715,481	12,402	2320
Farmland	10,530,819	52,943	126,775
Total Area	24,155,496	65,545	172,968
Crop area in 2008/2009 (Hectares) (Uganda Bureau of Statistics, 2010)			
Area under rice (2nd season in 2008)	38,803	858	0
Area under rice (1st season in 2009)	36,282	903	0
Total area under rice (2008/2009)	75,086	1761	0
Area under Potato (2nd season in 2008)	17,374	0	4668
Area under Potato (1st season in 2009)	15,384	0	3767
Area under Potato (2008/2009)	32,758	0	8435
Production in 2008/2009 (MT)			
Rice	190,736	3433	0
Potato	154,435	0	45,578

² Fig. 2 shows the greater Kabale district before it was divided into Rubanda and Kabale district on 1st July 2016, prior to which Rubanda was a country in Kabale district.

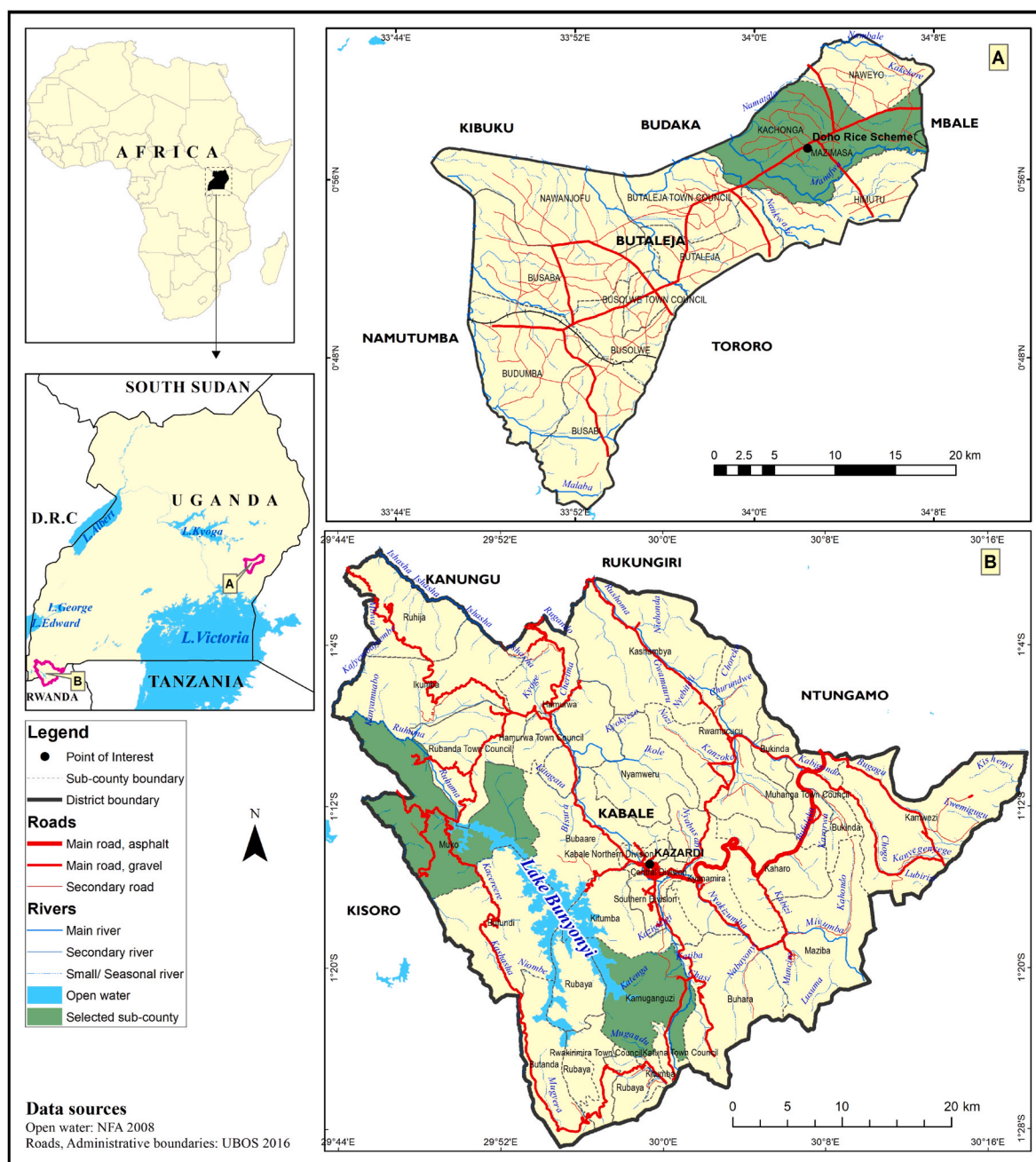


Fig. 2. Study districts and sub-counties in Uganda.

3.3. Data analysis

Content and descriptive analysis were used in this study. The content (document analysis) and descriptive analyses (from both the FGD and the farmer survey) provided an analysis of the intended vis a vis the actual services provided by the respective institutions and hence provided a progressively more in-depth information from one method to the next. The document analysis characterized the roles that the organizations played in SCI, their level of operation, within the district. The results of the FGD's were analyzed to further characterize organizations in the study sub counties and their roles. At the farm level, smallholders' perceptions of organizations involved in SCI were analyzed using descriptive analysis (frequencies) and rating of aspects of service provision based on their perception of service provision. These aspects included their contributions, roles, perceptions of the level of influence, timeliness in service provision, and sustainability of service provision by

organizations that provided services on SCI. These analyses were then used to decipher the institutional contributions of the different organizations to SCI.

Hedonic measurements according to Jarger and Cardello, (2009), is the cornerstone of sensory science therefore it provides critical information about the likes and dislikes of different products. Although this type of measurement can be slow to be understood and hence slow the measurement process, it gives more freedom to express the sensory perceptions and accurately assess acceptance (Pimentel, Gomes da Cruz, & Deliza, 2016). The farmers survey measured their perception of performance of organizations using the hedonic scale. On a scale of between 0 and 5, 0 was not applicable 1 = poor 2 = fair 3 = good 4 = very good 5 = excellent. The hedonic rating of each organization was used and averaged using several respondents who rated that specific organization as a divisor. Respondent provided supporting reasons for different hedonic responses.

4. Results

The characteristics of the household interviews are presented in Table 2. The respondents of the study were middle aged (45 years) with between 6 and 9 years of education which predominantly translates to and over 16 years of farming experience (Table 2).

The respondents played the role of being farmers in their respective value chains. However, others were also traders, millers and input dealers. About half the Kabale district sample comprised female headed households while the female headed household comprised about a quarter of the Butaleja district sample.

4.1. Identification, description, and role of organizations in SCI

Collectively, the main institutional contributions made to SCI during the study period were infrastructure development, maintenance of irrigation equipment, capacity development (provided by all organizations), and loan provision. Different institutions played separate roles within the value chain (Fig. 3; Fig. 4). Farmers recognized the primary supportive organizations to them as state and farmers organizations. However, these activities were principally located at the production end of the value chain and operated at the village/sub-county (micro) level. Potato farmers noted limited value addition from potato production (Fig. 3). A similar finding was reported in a value chain study conducted in southwestern Uganda, where 75% of the respondents indicated that wholesalers influenced the quantity, quality, and price of potato produced while only 4.8% of the groups indicated that potato processors influenced their production decisions (Mbowa & Mwesigye (2016).

State organs set the political scene for the potato and rice sector by harnessing their importance as a priority and strategic crop respectively at the national scale, hence supporting the enabling environment. State institutions contributed to infrastructure development and maintenance, and input supply. Through decentralized state organs such as the District Local governments (DLGs), the government provided infrastructure development for rice production. The contributions by Butaleja District Local Government (BDLG) for example, included the collaboration between the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) and the DIFACOS to renovate the Doho Rice Irrigation Scheme and strengthen the capacity of rice farmers on Good Agricultural Practices (GAP).

Cooperatives, farmers'- and other associations through their pivotal role in providing vertical and horizontal linkages contributed varied services ranging from capacity development to tractor and machinery

Table 2
Characteristics of households.

Characteristic of Household	Butaleja (n = 67)	Kabale (n = 68)
Age of household head (years)	45.4 (11.3)	43.7 (15.2)
Number of years in formal school	9.0 (4.2)	6.3 (4.2)
Years of experience in farming	21.8 (9.5)	16.1 (10.7)
Female headed households (%)	28.4	47.1
Marital status of household head (HH)		
Married	95.5	77.9
Widowed	1.5	16.2
Single	3.0	2.9
Divorced		2.9
Relationship of respondent to HH (%)		
Head	74.6	69.1
Spouse	22.4	25.0
Child	1.5	2.9
Other	1.5	2.9
Role of the HH in rice/potato value chain (%)		
Farmer	86.6	91.2
Farmer and trader	10.4	7.4
Farmer, trader, and input dealer	1.5	
Farmer, trader, miller, and input dealer	1.5	
Farmer, input dealer		1.5

Table 3

Institutional arrangements associated with SCI.

Meso level institutional constraints <ul style="list-style-type: none"> • Lack of policies and enforcement procedures to govern sustainable crop intensification for potato and rice crops • The prohibitive cost of capital provided by the private sector, • readily available fake and counterfeit inputs on the market • limited access to information on GAP • Lack of markets for potato and rice produce • High transaction costs associated with construction and maintenance of infrastructure 	Substitutive formal institutional arrangements Cooperatives collaborated with DLG's to develop formal and informal bylaws that alleviate the bargaining costs and ensure enforcement of sustainable practices for potato and rice production. Competitive formal institutional arrangements Cooperatives collaborated with DLG's to provide a bouquet of services under the cooperative including information, production finance, genuine inputs, market access. Accommodative formal institutional arrangements Cooperative collaborated with DLG to renovate infrastructure for rice production
Micro-level institutional constraints <ul style="list-style-type: none"> • The prohibitive cost of capital 	Substitutive informal institutional arrangements VSLA's, provide production finance to producers to circumvent the prohibitive cost of capital.

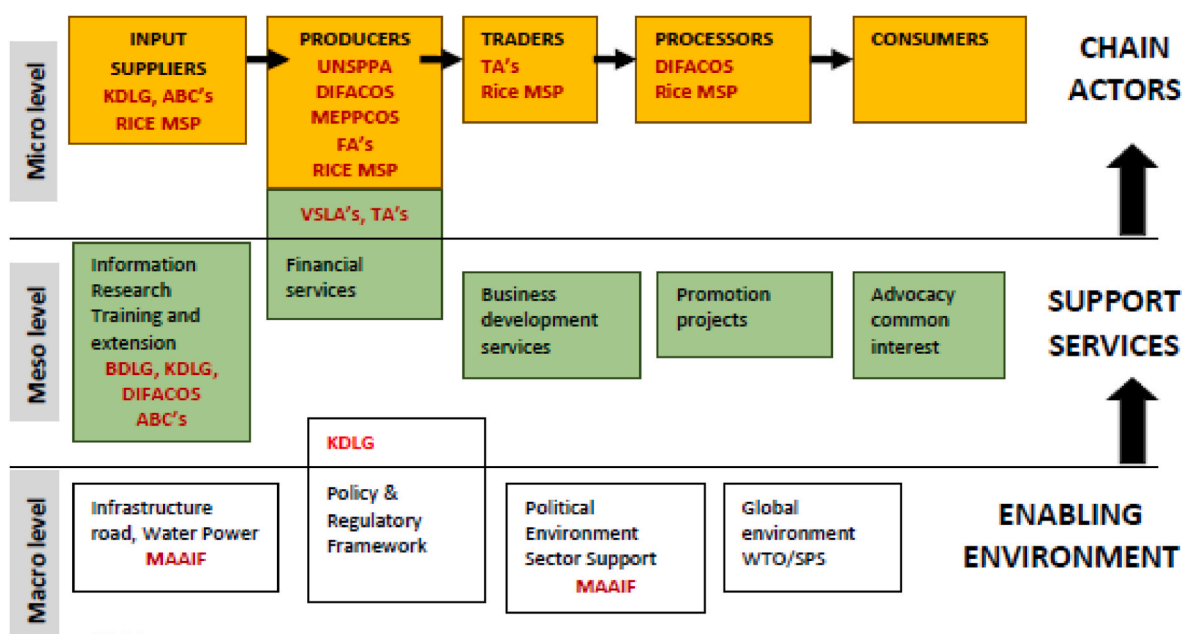
Authors compilation based on (Estrin and Prevezer, 2011).

provision to lobbying for collective markets at the district level. Smallholder governance structures for the farmers in the potato sector and rice to a limited extent were developed to facilitate aggregation of farm produce, equitable price negotiations, market linkages, and economies of scale in productive capacity, and collective purchase of inputs. Potato farmer groups consolidated into farmer associations to ensure access to government programs at the district level. Cooperatives were registered through local governments with the Ministry of Trade and Cooperative (MoTC). The Agri-Business Clusters (ABCs) were thirty farmer groups aggregated to focus on the marketing and value addition segment of the potato value chain. ABCs were not formally registered and needed to establish binding governance structures such as laws and regulations to guide farmer operations.

The Muko Expanded Potato Producers Cooperative Society (MEPPCOS) from Kabale had a large farmers' membership where Farmer Field and Life School (FFLS) and Farmer Business Schools (FBS) methodologies increased production, promoted co-operative strategies for crop marketing, facilitated and provided access to financial services through Village Savings and Loans Associations (VSLA's) membership. Farmers self-mobilized funds from about 30 VSLA members to circumvent limited access to production finance due to collateral requirements, and high interest rates. The VSLA system used social collateral and social capital systems that did not require collateral. Traders and traders' associations provided loans to rice producers in Butaleja. In Kabale, FGD respondents reported that strong trader's associations could facilitate the development of a code of conduct to guide traders' engagement with smallholder farmers. As market institutions, input dealers were perceived to be less organized because of limited numbers and, without common platforms to create standards and self-regulation mechanisms. Hence a prevalence of counterfeit and fake inputs.

4.2. Government institutions were perceived as authorities in production but limited by finances

Overall, the sustainable achievements of state organs were infrastructure development and maintenance, capacity development, and regular supervision of production activities by government officials (Fig. 5). State organs were perceived to reach a wider target audience than farmers' organizations but were also considered as being an authority in crop production. Respondents acknowledged that formal institutions provided quick interventions during disasters and valued them



KEY

MAAIF – Ministry of Agriculture Animal Industry and Fisheries
KDLG – Kabale District Local Government
BDLG – Butaleja District Local Government
UNSPPA – Uganda National Seed Potato Producers Association
DIFACOS – Doho Irrigation Farmers' Cooperative Society
MEPPCOS – Muko Expanded Potato Producers Cooperative Society
TA's – Traders Associations
FA's – Farmers Associations
Rice MSP – Rice Multi Stakeholder Innovation Platform (NARO)
ABC's – Agribusiness Clusters
VSLA's – Village Savings and Loans Associations

Fig. 3. Perceived organizational roles played in service provision. Adapted from (Mbowa and Mwesigye, 2016).

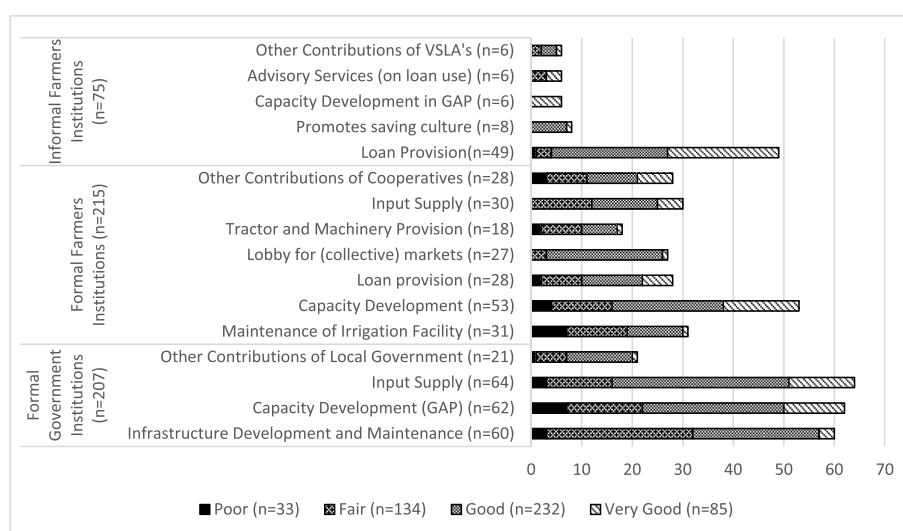


Fig. 4. Contributions by different institutions to SCI.³¹

for their role in input supply. Kabale district respondents believed that KDLG promoted SCI through the distribution of clean planting materials. Government organs were mandated to provide parent stock and new varieties for both rice and potato through their research institutes that implemented breeding programs but also through government programs

such as the Operation Wealth Creation (OWC) that distributed farm inputs as part of the National Agricultural Advisory (NAADs) services. The farmers in Kabale also valued state organs for their engagement in the development of local policies (by-laws) on SCI in the potato sector (See ((Makuma- Massa et al., 2020)).

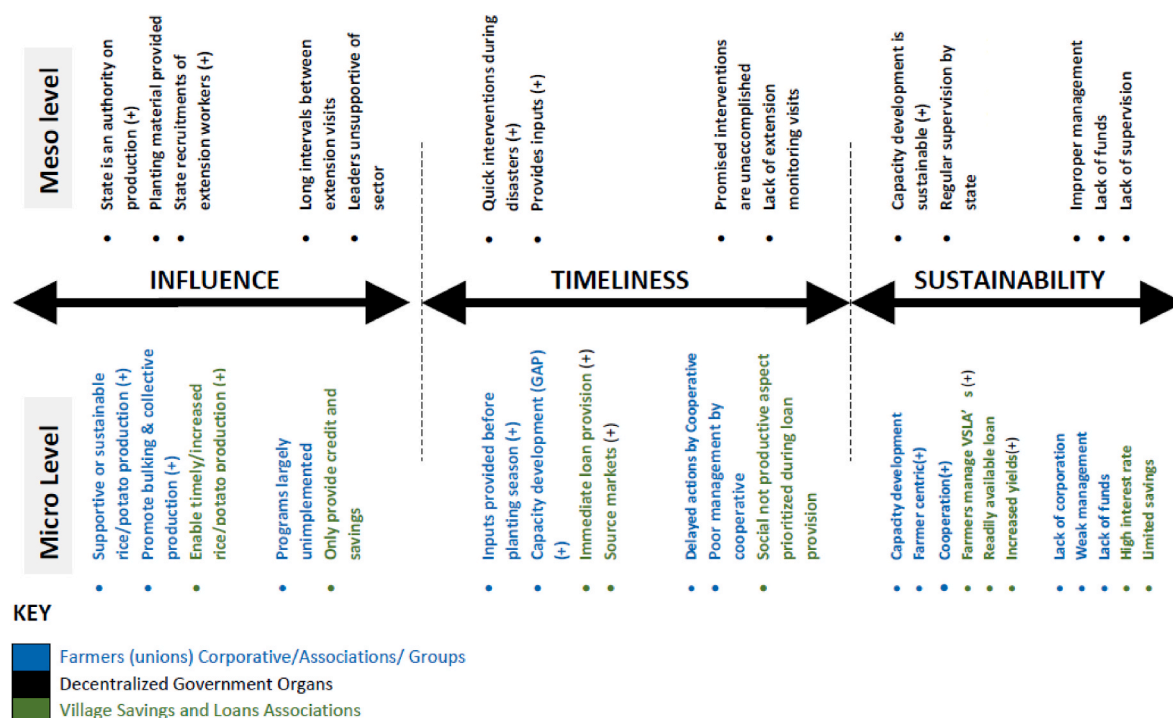


Fig. 5. Perceptions of the level of influence, timeliness, and sustainability aspects institutions provide to SCL.

Local Governments either delayed or terminated delivery of GAP training, input distribution, and other services which affected farmers' perception of DLG's efficiency. The DLG's showed a lack of coordinated activities at the district level (e.g., in ineffective and unclear planning activities and strategies, untimely, delayed and terminated service delivery), a lack of cooperation with cooperatives and farmers' association's plans and exhibited inefficient use of their limited resources. Respondents from Kabale gave examples of lack of follow-up training and poor inter-departmental co-operation within the DLG but also particularly their poor support to conflict resolution of community land and water disputes.

4.3. Farmers centric, collaborative, all-inclusive but poorly managed formal farmer institutions

For formal farmer groups, cooperatives, and associations (farmers' formal institutions), the sustainable aspects of the services provided were perceived to be capacity development and their farmer-centric nature. Formal farmers' institutions were perceived to support potato and rice production through their large network of farmers, advocacy for collective production, and renting inland to increase production, in Kabale. Farmers from Kabale reported that joint capacity development organized by rural farmers' institutions and DLG's on positive seed selection was beneficial in eradicating bacterial wilt disease in potatoes while the prompt provision of inputs i.e., before the production season began enabled farmers to execute farming activities promptly. DIFACOS for example, was perceived to have facilitated Doho rice scheme administration, promoted rice processing and storage facilities, maintained (cleaned) irrigation channels; ensured equitable and timely distribution of irrigation water, and advocated for, and promoted mechanized rice farming, and solved land disputes. In Butaleja, DIFACOS mobilized irrigation scheme users to develop a regulatory system to govern rice cultivation practices and efficient water use. MEPPCOS engaged in the construction of a warehouse for potatoes, increased

annual membership, and increased quantities of a potato sold through the cooperative.

The lack of cooperation and weak management within the formal farmers' institutions were viewed as unsustainable. The cooperatives were perceived to have a limited extent of proper administration and management (planning, limited transparency) procedures, lack of teamwork among the leaders, and cooperation with other institutions. Respondents from Butaleja cited that the contributions of formal farmers' institutions were unsustainable due to lack of coordination between the cooperative society leadership and the DLG in maintaining and renovating the Doho irrigation scheme, lack of loan facilities to fund farmers production activities, and weak leadership within the cooperative societies. Cooperatives had limited capacity to implement program objectives efficiently and they had weak institutional arrangements. In Butaleja, a weak exhibition of institutional capacity was observed where members' interests were not integrated into the cooperative's work plan.

4.4. Small, flexible, popular but farmer-owned informal farmers' institutions

The informal farmer's institutions' major achievements were to promote savings and provide loans in support of larger-scale production. Their perceived notion of sustainability was that farmers cooperated to manage their own VSLA's, and finances were more readily available to support increased production. The VSLA's enabled timely rice and potato production through loan provision and increased access to improved seed amongst potato growers which especially increased the net returns per unit of land. The VSLAs were valued for their immediate loan provision. Access to financial services increases the productive capacity of producers by ensuring access to crucial production inputs including improved seed, land, and labor.

However, these informal institutions only provided savings and credit and were limited in their provision of other services. Respondents perceived that the high interest rates made loans inaccessible, and their loan portfolio had competitive uses i.e., loans received were diverted to school fees payment for example. VSLAs were also perceived to have a

³ Multiple Responses.

limited capacity to mobilize base capital i.e., finances were insufficient to satisfy members' requirements. While farmers perceived VSLA's as Community Based Organizations (CBO's), VSLA's guaranteed sustained results in terms of improved production but others argued that these VSLA's needed to collaborate with the private sector including larger farmers cooperatives and banks, to increase and further sustain loan fund availability. Their high-interest rate and limited savings hindered the sustained use of this source of finance.

5. Discussion

5.1. Institutional synergies through existing collaboration and integration

Formal farmers' institutions facilitated producers' access to services and provided an avenue for other actors to access farmers and hence improve sustainable crop productivity. Synergies were also observed through collaboration between the local governments and cooperatives to develop infrastructure and strengthen smallholder ability to improve their productive capacity. An example included the BDLG and DIFACOS collaboration during the Doho irrigation scheme renovation and rehabilitation where BDLG represented MAAIF to mobilize machinery and finances while DIFACOS sensitized and mobilized member irrigation users to provide labor for the activity. During capacity strengthening exercises, cooperative societies provided the training venue and mobilized participants while DLG's provided expertise for the capacity strengthening exercises. These institutional arrangements between farmers' organizations and the government accommodated the prohibitive cost of infrastructure development and maintenance (Table 3).

In Butaleja, about 36 Informal farmers' institutions associated themselves with DIFACOS's SACCO to increase their loans, savings, and borrowing capacities where they could borrow up to ten times their savings with the SACCO at interest rates of between 4 and 5% charged to the VSLA by the cooperative. A study by Mbowa and Mwesigye (2016) established that potato production was primarily financed by personal savings followed by the VSLA's which were known to charge a higher interest rate but had better repayment terms. The VSLA then charges between 6 and 10% to farmers, which allows a profit margin for VSLAs. Several studies (see Barungi and Odokonyero, 2016; Mbowa and Mwesigye, 2016; Yami and van Asten 2018) acknowledge a heavy reliance by smallholder producers on informal financial institutions such as VSLA's and informal saving schemes in Butaleja and Kabale as credit sources. Respondents noted particularly that although collateral was not required; interest rates were high despite low loan amounts expensed. Indeed, a study by Estrin & Prevezer (2011), introduces the notion of substitutive informal institutions where private sector financial institutions, have informal mechanisms that compensate and replace them—i.e., substitutive informal institutions—that in this case promote opportunities for farmers to access financial service to improve their productive capacity.

The operational challenges of VSLAs included high-interest rates and the low funding capacity of these institutions. Furthermore, VSLAs were informally established. Attempts to formalize them would include the development of formal rules and regulations and registration as financial institutions. Formalization would enable VSLAs to collaborate with bigger financial institutions to increase their loan capacity. However, the formalization of financial institutions would operate even more efficiently under an enabling policy environment. Savings and credit organizations (SACCOs) are legal bodies registered under the Uganda Cooperative Statute of 1991 and Cooperative Societies Regulations of 1992, however, there is currently no policy that governs the operations of SACCOs or VSLA's.

In Kabale, a higher degree of institutional articulation was observed towards sustainable potato intensification. Services that were provided by market institutions such as input dealers and traders' associations were absorbed into the operations of the co-operatives to enhance collective marketing, increased volumes that were marketed, ensure access

to superior quality inputs, etc. This high degree of institutional articulation occurred to circumvent market failures as exhibited by an over-supply of counterfeit products. The creation of an all-inclusive farmer cooperative amongst these institutions was found to be an innovation amongst co-operatives and showed a competitive institutional arrangement (Table 1). However, collaboration and integration can be better facilitated by creating a long-term vision that ensures the construction of horizontal and vertical networks to create an inclusive, sustainable, and flexible agricultural support system (McC Campbell, 2015) including strengthening the governmental institutional base ((World Bank, 2018)).

5.2. Vertical integration across institutions enhances micro-level engagement and outcomes

Trends in perceptions showed that farmers' organizations were more valued than governmental institutions in both districts. From our study, it is evident that over and above their organizational mandates, co-operatives, and VSLAs collaborated to integrate services at the micro-level in the absence of equitable service provision by intermediaries, formal financial institutions (banks), traders, and input dealers. Furthermore, macro and meso level institutional linkages were the missing link from the micro-level institutions. Market institutions (traders, their associations, and input dealers) were reported to be without common platforms to create standards and self-regulation mechanisms resulting in the circulation of counterfeit inputs. They were insufficient in number, disorganized, accused of exhibiting opportunistic behavior by claiming large proportions of farmers' harvest as a form of loan repayment during rice production. The Input dealer's disorganization results from limited numbers. The activities of potato and rice platforms and/or steering committees, the Zonal Agricultural Research Institutes (KaZARDI and BugiZARDI), UNSPPA, ABC's (in the case of potato), and macro-level institutions were unknown or not discussed. This shows poorly integrated linkages amongst different organizations and institutions at the meso and macro levels. At the institutional level, a void in service provision by meso and macro level organizations may manifest in form of an inability to address long-standing productivity challenges. These include shortages of quality seed potato (Gildermacher, 2012; Mbowa and Mwesigye, 2016) which emanates from an unregulated, underdeveloped seed system. High-quality clean seed potato only supplies less than 5% of Uganda's entire seed market (Byarugaba et al., 2017).

Overall, it was evident that the perceptions of respondents from Kabale were more positive than those from Butaleja. However, reported challenges that were faced by cooperatives included inadequate numbers that constituted their membership, weak leadership, mismanagement, and misallocation of limited funds at the disposal of co-operatives, which negatively affected the implementation of cooperative interventions. Suggestions by discussants to improve how cooperatives operated included advancing bulking and collective marketing approaches to enable producers to sell potato in kilograms rather than in bags, increase bargaining power, and wider access to regional and national markets as opposed to intermediaries. In Butaleja, farmers suggested that cooperatives should lead the enforcement of the rice-cropping calendar and promote small-scale mechanization among smallholders.

5.3. Institutional challenges exhibited by formal institutions undermine engagement with and recognition by micro-level organizations

Governmental institutions were the least valued institutions for their financial mismanagement, lack of inter (with different farmer co-operatives), and intra (within organizational/departmental) cooperation and coordination. A case in point was the local government promoted and distributed tea as a cash crop at the cost of dual-purpose food and income-generating crops (e.g., potato) which sent mixed

signals to potato producers.

A study conducted by (Bratton, 2012), shows that local councils in sub-Saharan Africa were perceived by citizens as weak institutions with limited functions where elected councilors were found to be unresponsive. The Kabale District Local government (KDLG) strategic planning framework (KDLG, 2011) aims to achieve socio-economic transformation and development over 5 years from FY 2011/12. However, shortcomings culminate in ineffective and unclear planning activities and strategies, untimely, delayed, and terminated service delivery. These challenges according to KDLG (2011) emanate from underfunding local governments, lack of mentoring by the national government on the National Development Plan, and planning fatigue by the population at the micro-scale. The vicious cycle was characterized by fiscal years portrayed by untimely and insufficient financial quotas, budgetary allocations, and bureaucracy, which result in a lack of timely, participatory, and evidence-based, and inadequate district development planning. This in turn affects the annual financial allocations to local governments. However, at the other end of the spectrum, a World Bank analysis (2018:78) identified huge gaps of up to 50% between budgetary allocations to local governments and actual spending by Local Governments at the national level.

Discussants perceived that as meso level institutions, local governments could better facilitate mechanization, improve the intensity of activities, for example by providing more planting materials, and increasing access to genuine inputs, organizing more farmers for collective marketing, constructing warehouses, and improving irrigation and road infrastructure. The nature of these proposed activities is characteristic of trends where input distribution by the government is often subsidized and often substandard.

6. Conclusions

We provide an elaboration from a stakeholders' point of view, of how institutions deal with complex institutional challenges in potato and rice food systems. We found that based on farmers' perceptions, both formal and informal institutions contribute towards SCI, though informal institutions are more widely appreciated amongst actors than formal institutions. Furthermore, we established that agents within these informal institutions have found innovative ways to change and develop them by providing a multiplicity of services provided within a single organization. We therefore conclude that there is a lack of coordination between macro, meso, and micro institutions. However, where available, the institutional collaboration resulted in innovative ways of enhancing access to financial resources and collaborative methods of knowledge access. We believe that through this already emergent attitude of institutional entrepreneurship, private and public sector and NGO agents can recombine resources available in food ecosystems to improve the system-level functioning of their food chains through enhanced collaborative approaches.

The Government of Uganda could strengthen its public institutions through better sectorial, inter- and intra-institutional collaboration and integration with local governments for enhanced service provision and policies that enhance agriculture. Enhancing this public-private and civil society collaboration and networks at vertical and horizontal levels will enable better service provision and increased production and productivity. There is also a lack of policy support for SCI in Africa (Pretty et al., 2011:19) and east Africa ((Yami and Van Asten, 2017)). In the short term, policy support is effective in bridging the gap between potential yield and observed farm yields, expansion of extension services, facilitating learning processes, access to credit and insurance, and expansion of input-output networks (van Dijk et al., 2017).

This study underlines the importance of the inclusion of informal institutions through their interaction with the formal institutional framework specifically when seeking to enhance sustainable agricultural production and productivity. It only provides a glimpse into institutional collaboration, arrangements, and integration. We know

little about the specific actor interrelationships, their interactions, factors that constrain innovation in these food systems, and the actors that can influence or be influenced by emanating issues from these systems at a point in time, how these dynamics evolve with time and what factors affect their evolution with time. More needs to be done on how to operationalize the measurement of the effects of the interaction of informal institutions on formal institutions and as to how to conceive the boundary conditions between the distinct types of informal institutions for example (Estrin and Prevezer, 2011) and how to strengthen the informal institutions without them losing their key strengths and functions. This could represent a topic for future research.

Credit author statement

I Pamela Pali, the corresponding author of this manuscript, certify that the contributors' and conflicts of interest statements included in this paper are correct and have been approved by all co-authors.

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Data availability

Data will be made available on request.

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