CHAPTER FIVE

5.0 Building Innovation Networks in Dried Cassava Value Chain: Qualitative Evidence from Innovation Brokerage

Athman H. Mgumia[1], Amon Z. Mattee[2] and Beatus A. T. Kundi[3]

[1]Tanzania Commission of Science and Technology
[2]Sokoine University of Agriculture, Department of Agricultural Education and Extension
[3]Department of Mechanical & Industrial Engineering, College of Engineering & Technology (CoET) – University of Dar es Salaam, Tanzania

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Authors' contributions

This work was carried out in collaboration between the Authors. The first Author, Mgumia, A. H. designed the study, collected data, performed the data analysis and wrote the first draft of the manuscript. The second and third author Prof. Mattee, A. Z. and Prof. Kundi B. A. T. gave comments; all authors read and approved the final manuscript.

Abstract

Agricultural development in developing countries is challenged by weak innovation systems and lack of innovation capacities among key actors. Integration of agricultural innovation perspectives and value chain approach for development have made the interaction between a wide range of actors of innovation to become more complex demanding different sets of knowledge, environment and incentives. The traditional homogeneous intermediary layer of agricultural extension appeared to be ineffective to this situation. As a result the majority of smallholder farmers are facing exclusion from participating in supplying the long value chains. In countries characterized by mature innovation systems, a specialized innovation-brokering role emerged as an alternative to deal with innovation challenges in agricultural sectors (market and system failures). This study, using a case study approach, intended to offer empirical evidence of the roles of innovation brokerage implemented on cassava value chain by NGOs in the setting of developed countries and where the innovation brokerage is not recognized by the agricultural knowledge infrastructure (R&D institutions and extension services). Important outcome of this analysis was that innovation brokerage roles were crucial in agricultural innovation as it is beyond the capacity of R&D extension service. Hence, the Ministry of Agriculture Food Security and Cooperative and other relevant stakeholders should recognize the innovation brokerage roles and establish an institutional framework for its functioning within the agricultural knowledge infrastructure.

Key words: Innovation broker, cassava, innovation network, value chain, Tanzania

5.1 Introduction

The number and diversity of stakeholders in agricultural innovations have been increasing in recent decades, making their interaction more complex and non-linear than they used to be (Chema *et al.*, 2003; Sumberg, 2005; World Bank, 2006). In addition and more importantly, with the ongoing promotion of Value Chain (VC) approach in agriculture (Anandajayasekeram and Gebremedhin, 2009: 22), farmers need to supply the long value chains which involve stringent quality and safety standards and regulations (Dolan and Humphrey, 2000: 158; Trienekens, 2011: 52). Smallholder farmers, in addition, need to establish new forms of collaboration so as to increase their capacities and bargaining position in the value chain (Rondot and Collion, 2001: 5). Thus, participation in agricultural innovation, particularly for the smallholder farmers, needs effective linkages and relationships that govern not only the flow of commodities along the VC (vertical integration) but also the flow of resources and knowledge needed to innovate at each node of the VC (horizontal integration) (Trienekens, 2011: 59-62; World Bank, 2006). However, the observed limited interactions of such important actors of innovation (farmers, agribusiness and government institutions) is often a result of inadequate capacity and lack of structure and incentives, rather than unwillingness of the actors to interact effectively. This role of facilitating horizontal integration is likely beyond the transfer-of-technology role of traditional agricultural extension services and also the roles and mandate of research institutions.

Recently, scholars in developed countries recognized the emergence of a specialized or systemic innovation intermediaries with an expanded role of public agricultural extension services (Klerkx and Leeuwis, 2009: Klerkx and Gildemacher, 2012; Klerkx *et al.*, 2009), which proved to be relevant in developing countries as well (Perez *et al.*, 2010). These evolving specialized intermediaries are distinguished from the innovation intermediaries

described by Howells (2006) by brokering innovation as its core function. Klerkx and Leeuwis (2009) called these new emerging actors as innovation brokers or systemic intermediaries. Innovation brokers mainly analyze the context, articulate demand, establish innovation networks and facilitate interactions (Klerkx and Gildemacher, 2012).

Currently, the agricultural policy of Tanzania emphasizes value addition to agricultural produce (VC approach) and provision of enabling environment to attract private sector investment (URT, 2013). This role is in alignment with the Agricultural Sector Development Programme (ASDP) (URT, 2003). However, so far, the contribution of innovation brokerage in agricultural innovation, particularly in terms of forging linkages among value chain actors has yet to be fully appreciated due to a lack of empirical evidence on its functionality. This paper contributes to this knowledge gap by exploring the kind of innovation brokering roles that have been played in project interventions that seek to foster value chain innovations.

Taking project interventions of Vredeseilanden Country Office Tanzania (hereafter referred to VECO Tz), an NGO working on dried cassava value chain as a critical case study, this paper aimed at describing the contribution of innovation brokerage on dried cassava value chain in Mkuranga District, Tanzania. The main research questions guiding this study were: what innovation brokerage roles were performed by VECO Tz on dried cassava VC in Mkuranga, and how have the roles contributed to cassava innovation. Although the findings presented in this paper relate to cassava production and processing, they present an example of innovation system in root and tuber crops which are faced with the challenges around improvement of their seed system, as they mainly use vegetative propagation planting materials (stem cuttings), hence, perishable and bulky, thus not attractive for commercial multiplication and dissemination.

5.2 Conceptual framework

5.2.1 Concept of innovation as an expansion of technology transfer

Contrary to the conventional technology transfer in agriculture, which is essentially a linear movement of knowledge (mostly knowledge on how to apply the technology) from research to extension services to farmers, innovation is a complex and dynamic process, taking place in interconnected networks of actors (both in supply and demand sides) to generate and use new knowledge and other resources to innovate (World Bank, 2006). Looking at it in a different perspective, an innovation constitutes of: technology (product or process), knowledge (how to use the technology) and a social component representing a third embodiment which includes organizational arrangements, compliance with quality standards, appropriate policies, incentives, which are needed to convert invention into innovation (Vermeulen *et al.*, 2008; Vellema and Boselia, 2003). Smits (2002) defined the three embodiments of innovation as: Hardware, software and orgware. The first two embodiments of technology (hardware and software) are easy to disseminate through technology transfer (Bozeman, 2000; Li-Hua, 2006; Gopalakrishman and Santoro, 2004). However, with the current type of technology and multiple actors of innovation with diverse interests, the third embodiment (orgware) of technology becomes crucial. This indicates how challenging it is for an individual actor such as a research institution or agricultural extension to innovate or participate in innovation.

Likewise, technical knowledge alone is not sufficient to achieve successful innovation; a process of social learning is also becoming an important part of innovation. Social learning, according to scholars in innovation systems, includes imparting new skills to participating actors, flexibility in organizational roles, ability to navigate positions along the value chain, and negotiating and sharing benefits among actors (Leeuwis, 2004). In order to achieve these outcomes of social learning, proper facilitation of the social

organization of innovation by the way of providing space for interactions between different actors to innovate (Smith and Raven, 2012: 1027) is required. Hence, systemic intermediaries or innovation brokers are better positioned to facilitate establishment of functional orgware part of innovation and social learning than the traditional extension services.

5.2.2 The concept of innovation brokers as specialized innovation intermediaries

Winch and Courtney (2007) defined an innovation broker as 'an organization acting as a member of an innovation network of actors that is focused neither on the generation nor the implementation of innovations, but on capacitating other organisations to innovate'. Innovation capacity, on the other hand, refers to the capacity of the innovation system to adapt and involve reworking ideas, resources, relations and links (Ruben *et al.*, 2006). In VC, for example, innovation brokers, thus, focus their attention on linkages and relationships governing the knowledge flow, which is contrary to the linkages and relationships governing the movement of commodities, although, in some cases the actors involved may be the same (World Bank, 2006).

Innovation brokers target multiple actor relationships (systemic focus) rather than individuals. Klerlx and Leeuwis (2009: 851) figured the relationship of innovation broker as many–to-one–to-one, one–to-one-to-many or many-to-one-to-many, as compared to that of innovation intermediary which, as argued by Howells (2006), operates in a simple triadic of one-to-one-to-one. Hence, it requires a different role to enhance continuous 'interface management' (Smits and Kuhlmann, 2004), which involves:

(i) Context analysis, articulation of demand for technology, knowledge, funding, favourable policies through problem diagnosis and foresight exercises (Klerkx and Gildemacher, 2012; Klerkx and Leeuwis, 2009);

(ii) Facilitation of linkages between relevant actors aiming for innovation network building (Howells, 2006) and providing platforms for decision-making (Klerkx and Leeuwis, 2009).

(iii) Facilitation of interaction between various heterogeneous actors whereby innovation brokers traverse a range of roles: managing conflicts, building trust among the partners, fostering learning, managing intellectual property (Leeuwis, 2004) and testing new ways of doing things.

In developing countries (particularly SSA) however, the national innovation systems and Intellectual Property Rights (IPR) regime are still immature, and most of agricultural technologies are generated from public institutions. Thus, in these (developing) countries, the innovation brokers are expected to be not-for-profit organizations such that they can perform functions more impartially to ensure the balance between supply and demand of technology including supporting emergence of capable business enterprises to deal with agricultural technologies. Also brokers need to provide enabling environment for actors from both private and public sectors to participate effectively in innovation (World Bank, 2006).

5.3 Description of the case: Dried cassava in Mkuranga District, Tanzania

Traditionally cassava VC mainly includes production and processing either as traditional cassava flour or frying / boiling fresh cassava. A successful introduction of cassava processing technologies in the rural communities since 2003 (Abass *et al.*, 2013) increased demand for fresh cassava and, therefore, enhanced farmers' willingness to adopt improved production technologies particularly new varieties, in order to increase cassava productivity and expand production (Abass *et al.*, 2010). However, the biological features (vegetatively propagated) and economical features (public good) of these cassava

technologies hinder or exclude majority of smallholder farmers in rural areas from producing cassava commercially. For example, the multiplication rate of the vegetative planting materials (cuttings) is very low, bulky and highly perishable. These characteristics have made commercial multiplication of cassava-planting materials unattractive to entrepreneurs. On the other hand, majority of smallholder farmers are yet to participate and benefit fairly in dried cassava value chain due to higher cost of the cassava processing machinery, stringent food safety standard requirements and the large quantities of the intermediary shelf-stable cassava products demanded by the market (Ruben *et al.*, 2006, Vermeulen *et al.*, 2008).

5.4 Methodology

5.4.1 Study area

Mkuranga is one of the six districts of the Pwani Region. Cassava is a major food cum cash crop traditionally traded through a fresh cassava value chain. VECO Tz works in partnership with other actors according to their complementary attributes (resources, institutional roles, expertise) in fostering innovation networks in dried cassava value chain; thus, it was identified to be a critical case for this study. VECO Tz was active in Mkuranga District from 2008 – 2013 and aimed at enabling smallholder farmers to increase productivity and income through commercial farming of cassava. The project covered a total of 16 villages, which constitute the study area.

5.4 2 Data collection and analysis

Due to the qualitative nature of the research questions, the research adopted a case study design. This approach is appropriate in answering 'how' and 'why' questions (Yin, 1994) and for studies whose objective is to offer description, exploration or to generate and test theory (Creswell, 2007). As the study aimed at describing the planned and evolved

processes for cassava innovation, the case study was found to be an appropriate research design. Data were collected between November 2013 and March 2014. A total of 11 interviews (Appendix 8, 9 and 10) were conducted involving 18 key informants: three VECO staff; one extension officer, the local coordinator; 10 farmers from different villages and farmers' groups; chairman of *Mtandao wa Vikundi vya Wakulima Tanzania* (MVIWATA); Manager-cum-sells officer of bulk marketing center and two staff from small and medium enterprises support programme, in kiswahili commonly known in Kiswahili as *Muunganisho wa Ujasiriamali Vijijini* (MUVI).

The data were supplemented with observation during site visits and activity reports including minutes of stakeholders' meetings. Various data collection methods and multiple sources were used to understand clearly the processes but also to ensure reliability and validity respectively (Yin, 2002) including: primary source materials (detailed interview), literature (activity reports) and observation on cassava value chain in Mkuranga District. Qualitative materials were analyzed using qualitative content analysis, which involved reading through the field notes and transcribing them to identify key themes and patterns relevant to the research questions and concepts (Patton, 2002), and presenting empirical evidence of facilitated innovative processes by innovation brokers.

5.5 Case study: VECO Tz as an innovation broker in dried cassava value chain in Mkuranga District

5.5.1 Establishment of farmers managed Cassava Seed Multiplication Farm (CSMF)

VECO Tz conducted cassava value chain analysis to identify potential actors in dried cassava value chain in Mkuranga District. The actors identified were trained and assigned specific tasks relevant to their capacity, experience and institutional roles. The agreements were formalized with a Memoranda of Understanding (MoUs). The actors included:

Agricultural Field Officers (AFO) from District Agricultural Irrigation and Cooperative Office; *Mtandao wa Vikundi vya Wakulima Tanzania* (MVIWATA) and researchers from agricultural research institutions.

MVIWATA triggered the process by mobilizing farmers from 16 villages that constitute the project area to form groups; 40 groups were formed. The AFO provided training on agronomic practices and oriented the group members towards commercial cassava production. In partnership with farmer groups, 40 on-farm demonstration plots and 16 Farmer Field Schools (FFSs) (one in each village) were established to promote new agronomic practices aimed at increasing cassava production. Due to limited number of AFOs; VECO Tz, in collaboration with the District Agricultural Office and researchers, trained two farmer representatives from each farmer group to become paraprofessionals.

In addition to promotion of agronomic practices, evidence from demonstration plots and FFS, articulated the demand for the clean cassava planting materials (cuttings). Responding to this demand, VECO adapted a model of commercial 'Farmer Managed Cassava Seed Multiplication Farm' (CMSF) which was developed by the Food and Agricultural Organization (FAO), and implemented in nearby villages. To implement the model, VECO supported establishment of multiplication plots in each of 16 villages (this activity was not in VECO's original plan). These farms were owned and managed by the farmers' groups. VECO provided initial seed (cuttings) to the CSMF from agricultural research institutions (research center specialized in root crops and sugar cane research), and supported field inspection, which was done by researchers in collaboration with paraprofessionals who were trained by VECO for the purpose. As a consequence, the outstanding massive demands of clean planting materials at the District Agricultural Officer (from within and outside the District) were directed to CSMFs. Throughout the

process, VECO remained as the lead operator and facilitator and also responsible for the financing of the activities and capacity building to orient all collaborating partners towards a common vision.

5.5.2 Establishment of cassava processing centers

To advocate for dried cassava VC against traditional fresh cassava VC; DAICO, as part of its responsibilities in the MoU, organized practical training on processing cassava intermediary products (chips and flour). Forty farmer groups from the 16 villages were trained on processing technologies, and at least one-machine operator was also trained from each group (A portable machine was used for the training). However, the number of group members (15-25) was insufficient to own and efficiently use the machines. Hence, VECO proposed joining at least three groups to create bigger but manageable groups, and called them Community Family Farmers' Organizations (CFFOs); a total of six organizations were formed.

Then, VECO ordered six sets of cassava processing machines from a local manufacturer; each set consisted of a chipper, grater and milling machine. The machines were made available to CFFOs under hire-purchase arrangements. It was up to the group to decide on which type of machine they needed basing on the knowledge provided and the market situation (Box 1). To ensure the quality of the product, VECO supported a seminar on quality control conducted to group members by the Tanzania Food and Drugs Authority (TFDA).

Box 1: The products demanded by consumers determined the kind of the machine needed by CFFO.

Taking an example of one CFFO known as *Kizapata* agriculture and marketing primary cooperative group, it started with a chipper and used common milling machines to produce cassava flour from cassava chips. Unfortunately, the cassava flour appeared to be blended with unfavourable smell because the same machines were used for different cereals. So the group was forced to acquire a milling machine through the same hire-purchase arrangements. Again some of the consumers did not prefer cassava flour made from cassava chips as it had too much starch, which implied the need of using grater and not chipper in processing, hence the group had to acquire a grater as well.

Another challenge for the CFFO operations was the availability of adequate water. VECO, on behalf of CFFOs, wrote a proposal to raise funds for drilling deep water wells, which was submitted to BTC Tanzania, a Belgium NGO. The proposal for one center *Kizapata* was successful; VECO supported the drilling of deep-water wells for the other centers.

5.5.3 Establishment of District Marketing Bulking Centre (DMBC)

When CFFOs started to process cassava flour, it was realized that "quality of the product" was not the only requirement for accessing a reliable market but also the "quantity". Hence, VECO consulted experts from Moshi Cooperative College of Business Studies (MUCCOBS) to conduct a feasibility study for the establishment of the DMBC, and subsequently prepared the first three years' business plans for the same. The aim was to collect products from CFFOs, pack properly and sell them to consumers and bigger suppliers. The marketing center was established as an apex body for the CFFOs. Hence, named as Mkuranga Cassava Processing Cooperative Joint Enterprises (MKUCAPCOJE), and consisted of a governing board, marketing committee, manager and sales officer. The center was designed to generate funds from selling intermediary shelf-stable cassava products. VECO supported initial establishment costs including salary of the manager and

initial capital. Marketing committee members were trained on quality control and marketing.

Giving the center a status of District level offered an opportunity for other players (NGOs) working on dried cassava VC but in different villages to partner with VECO in supporting establishment of the market center. Therefore, VECO in partnership with other NGOs particularly the Rural Micro, Small and Medium Enterprise Support Programme (MUVI) facilitated other basic requirements such as: office furniture, preparation for the registration of the center as a cooperative (the process is still going on, currently it operates under the business name registration); and testing samples of the product by the Tanzania Bureau of Standards (TBS) clearance of which the product passed the test. When VECO phased out in December 2013, MUVI and the Local Government Authority (LGA) took over most of the activities of VECO. However, the DMBC is constrained by insufficient operating capital.

5.5.4 Enhancing interaction through District stakeholders platform

Since the first year of implementation, VECO facilitated an annual stakeholders platform to create awareness of the project, lobby, and advocate for political support from district officials and other key stakeholders. The stakeholders' platform created a neutral arena where different actors of the cassava value chain met face-to-face and had the opportunity to communicate their problems and share their experiences, challenge and opportunities. The stakeholders included: smallholder cassava producers-cum-processors, traders, researchers, government and private service providers, NGOs and decision makers such as District Commissioner (DC), District Executive Director (DED) and councilors.

Among the agenda discussed in the platform meetings were activity reports from VECO and other stakeholders. To make sure that the deliberations from the meetings were

implemented, in the first meeting, the platform formed a special committee to follow-up on issues raised and to get commitment from district authorities. This committee also involved farmer representatives, councilors, agricultural officers and MVIWATA members (MVIWATA, 2010). The main target for the committee was the District Executive Director (DED) who has authority and resources. Among the achievements of the committee was the commitment of the head of department (in District Council) to attend the subsequent stakeholder meetings. Also, the LGA formalized a position for a farmers' representative in the Ward Development Committees (WDCs) and the District Business Council. One of the functions of WDCs is to prioritize activities to be supported under the District Agricultural Development Programme (DADPs). Initially, VECO financed and organized the meetings, but later on other NGOs working on cassava in the District contributed.

5.6 Analysis and Discussion

The findings from this study were analyzed in the light of the concept of innovation brokerage in a system mode of agricultural innovation. The analysis intended to unpack the innovation brokerage roles to ascertain whether the contribution of innovation brokers' activities were linked to the developed cassava innovation networks, that put the improved cassava variety (Kiroba) in economic use.

5.6.1 Matching the interest of multiple actors of innovation to enhance innovation network formation

On mapping the actors involved in dried cassava VC and their relationships, two cassava innovation networks can be observed: the network for multiplication and commercialization of cassava-planting materials (clean cuttings) and network for producing intermediary shelf-stable cassava products (Figure 1). The findings show that

the formation of innovation networks was the outcome of different types of innovation brokerage roles fused in the facilitation activities done by VECO. Thus, the subsequent organizations and institutional arrangements (such as CSMFs, CFFOs, DMBC and stakeholders platform) and their contributions to the cassava innovation (which neither extension nor R&D institutions could achieve alone) form a critical part of the cassava innovation (Orgware) (Figure 1). This confirms that innovation brokers facilitate both tangible and intangible resources that are crucial for innovation to be realized (Klerkx and Leewis, 2009). Furthermore, the findings revealed how the innovation brokers combined technical potential of cassava technologies and existing opportunities (for example the experience of farmer managed seed multiplication and cassava processing technologies) to foster organizational and institutional innovations which, according to Hounkonnou *et al.* (2012), is one of the main limitations facing smallholders in SSA.

Analyzing the findings in the system perspective of agricultural innovation, the strength of VECO as an innovation broker was in line with mediation of multiple relationships governing the flow of knowledge among the actors of different backgrounds (Horizontal integration) (Fig. 1). Hence, innovation brokerage ensured involvement of the actors from key domains such as research, enterprise, extension, regulatory and demand sector. For example, flexibility in plan of action to accommodate the evolving roles enabled the establishment of farmers' group enterprises (CSMFs) and paraprofessionals, which were instrumental in seed multiplication and reducing the cognitive and cultural gap among the actors respectively. Also the neutral position of VECO in capacity building (training, budget allocation to actors, provision of incentive and initial capital) of the key actors, enhanced linkages, institutionalization of the project activities and articulation of demand for technical innovations. Hence the innovation broker contributed considerably to

formation of networks, facilitating interactive learning (Klerkx and Gildemacher, 2012) and also indicated willingness to withdraw when its presence was no longer required.

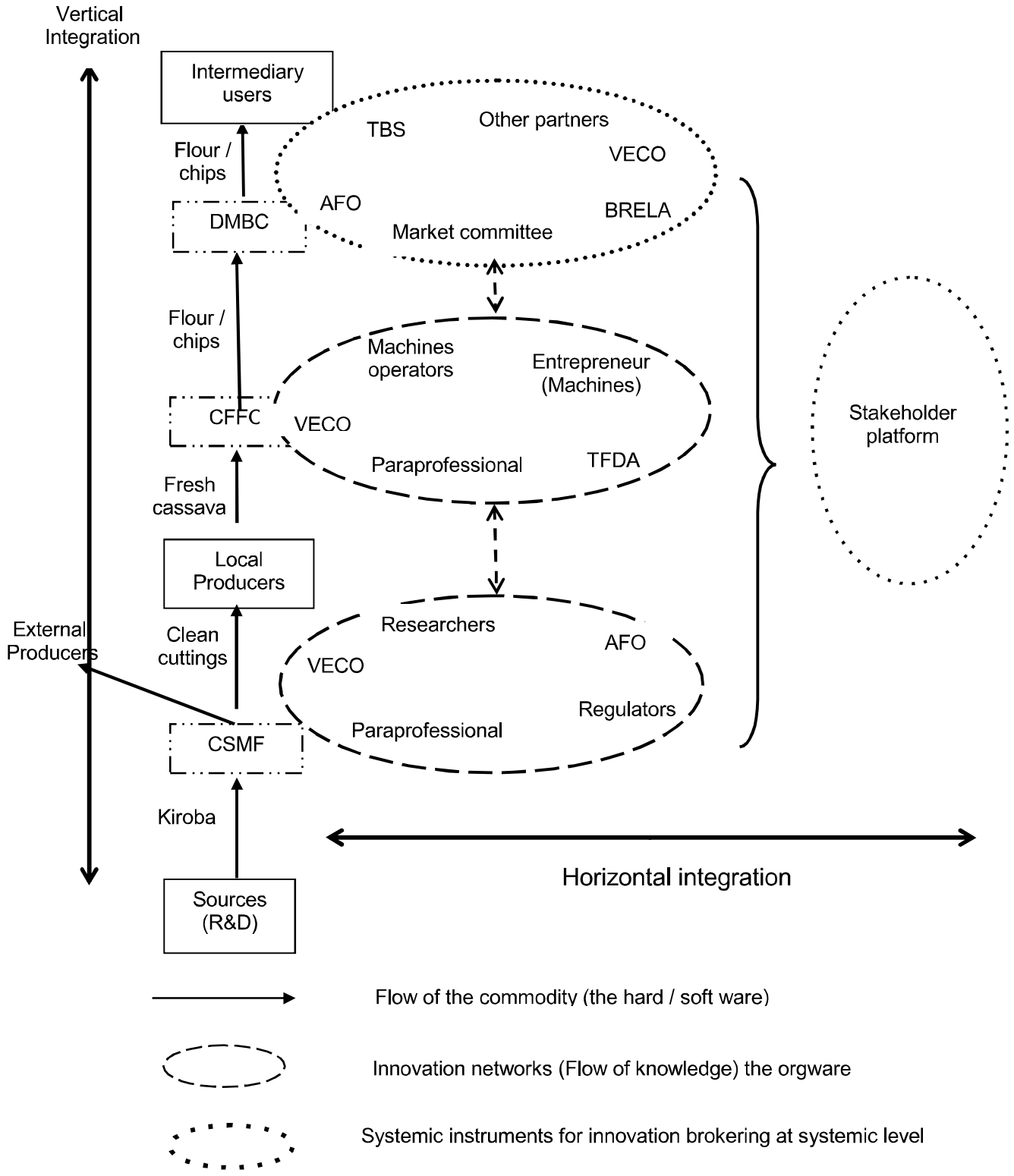


Fig. 1: The integration of the three parts of cassava innovation (Hardware, software and orgware).

The absence of reliable source (private sector) of cassava cutting and cassava processing enterprise extended the role of VECO beyond the bridging and brokerage to facilitate establishment of farmers' group enterprise to take up the roles. This was also possible due to the flexibility of the plan of action and neutral position of the VECO that enabled to balance the interest of multiple actors including: maximizing profit (as for case of CSMF, DMBC and CFFO); ensuring the good quality of products (regulatory bodies); scientific achievements (researchers) and adoption rate (extension service providers). In addition, through facilitation of tangible and intangible resources, farmers and other community members managed to build trust and culture of collective action as a leader of one group confessed: "…Through FFS we learned that working together is possible, since customarily we did not trust each other very much, and collective responsibility is also new in our culture…"

The findings concur with the previous observation on the context specific nature of the innovation brokerage roles (Klerkx and Gildemacher, 2012).

5.6.2 Optimizing system interaction: Linking cassava innovation networks with broader innovation

The findings show that DMBC and stakeholders' platform, established and maintained through bridging and brokerage roles facilitated by VECO, contributed much in stimulating and influencing the innovation process. The flexibility in the plan of action and through DMBC and Stakeholders' platform made it possible for VECO to navigate different positions (production, processing and marketing) along the dried cassava VC as well as mediation of several parties from different domains (research, business, regulatory, financial, LGA and farmers groups) (Figure 1). Thus, at each node, VECO facilitated innovative processes to ensure that supply and demand were balanced, potentials and

opportunities of the market and service providers were made known. This can only be possible under independent working positions (Hanna and Walsh, 2002). The functions of VECO, in this dried cassava VC demonstrated the more complex relationships intermediated by innovation broker (VECO) integrating both chain activities (vertical integration) and chain governance (horizontal integration) (Fig. 1).

Furthermore, the strength of VECO as an innovation broker was made possible through being transparent to other stakeholders, in terms of what it does and why. This practice stimulated knowledge sharing and commitment of other stakeholders in supporting what VECO was doing and avoiding misinterpretations. For example, other NGOs were ready to share the cost for organizing stakeholders' platforms, and when VECO phased out in December 2013, it was easier for the LGA and other NGOs working on dried cassava VC to take over VECO's activities and continue working with the same actors. These findings confirm that innovation brokerage through stakeholder platform contributes to institutional change and in turn has an effect on quality of interactions among the actors (Klerkx and Gildemacher, 2012). Another factor that can be attributed to the success of VECO as an innovation broker is readiness of VECO to forego some of the credit from their investments to go to other stakeholders to avoid diminishing ownership of the latter, as this is among the key features of the innovation brokers (Klerkx and Gildemacher, 2012). This was demonstrated when VECO handed over the bulk market to be a farmer-owned intervention. This may be difficult for other actors depending on their institutional policy or the policy of their financing institutions. The factors that enabled VECO to perform innovation brokerage successfully are summaries in Table 1.

Table 1. Factors for VECO to be successful in brokerage functions and outcomes

Successful factors	Outcomes
Context analysis and demand articulation	Took advantage of existing experience as well as linkages and relationships among the actors to enhance interactions.
Independent position and unbiased support (private, pubic and civil societies)	Established revolving fund in the form of hire-purchase of the processing machines
Flexible in plan of action	Establishment of farmer 'group enterprise to take up the roles of entrepreneurs such as CSMFs and CFFOs.
Transparent in what and why they do	Achieved common vision and understanding and avoiding misinterpretations
Shared the credit with other stakeholder particularly farmers	Enhanced ownership of the innovation processes to farmers
	Encouraged stakeholders participation and supporting the VECO activities including taking over brokerage activities when VECO phased out

5.7 Impact of the Innovation Brokerage to the Dried Cassava VC in Mkuranga

This section presents the impact of the interventions on dried cassava value chain by VECO, on the activities of the various chain actors in Mkuranga. Generally the approach in terms of what and how VECO performed its activities has impacted the key actors involved in several ways (economically, socially). As a result the cassava sub sector in Mkuranga is changing from semi subsistence to commercial, the quality of the cassava product is also given high consideration by both regulators (government) and consumers and most of its activities have been taken over after phasing out of VECO. The study revealed evidence from several actors along the dried cassava value chain as follows:

Broadly, VECO improved communication (contacts) from the reduced cultural and cognitive gaps and working coalitions formed between stakeholders as a result of innovation brokering, hence, dictated a more demand – driven advisory and extension service. Because of their neutral position and overview of the system that they can provide, VECO forged contacts between parts that would normally not cooperate.

Looking at the level of specific actors, farmers outside the project site (the 16 villages) started to prioritize cassava seed multiplication farm and cassava processing centers as a programme to be included in DADPs for government funding. Traditionally projects proposed in DADPs are mainly on infrastructure such as irrigation schemes and animal dips. In the financial year 2013/14 Mkuranga District, through DADPs supported four multiplication farms and four cassava processing centers.

The project activities along the value chain have reduced if not removed gender restricted roles. For example women are involved in farm activities, processing and marketing of cassava products. Men on the other hand participate fully in preparing (cooking) products such as cake, spaghetti, pasta. from cassava flour, traditionally this was not possible. These changes inculcated commercial perspective into cassava farming and broadened opportunities for self-employment for both men and women in the society. Another social impact realized is social capital built in the form of CFFOs that allows individual smallholder farmers to participate and benefit from a fairly cumbersome and costly cassava processing practice, and collective marketing of intermediary shelf-stable cassava products.

Mkuranga District, through DAICO also approved the funds and started construction of the District quality control center to cater not only for cassava products but also other

crops. The idea of establishing the center emerged from the challenges experienced by the DMBC. Furthermore, the district launched a campaign for establishing clean cassava multiplication farms at each village.

5.8 Conclusion and Recommendations

The findings from this study have demonstrated the innovation brokerage functions performed by development NGOs that were important for the establishment of innovation networks and therefore enhanced interaction in an innovation system. As this study indicated, innovation brokerage roles are crucial in the agricultural innovation as they operated beyond the capacity of the traditional technology transfer performed by the homogeneous intermediary layer of agricultural extension and R&D institutions. Innovation brokerage roles facilitate connectivity of different networks of actors at different levels crossing with interfaces of technologies, knowledge, civil societies and market domains; building the capacity of actors to innovate, resulting not only into tangible gains but also intangible ones. It is not, therefore, the technical potentials only that determine the extent of putting knowledge and technology into use; instead, it is a combination of the technology, organizational, institutional and governance innovations (organizations, routines and rules) that matters.

For innovation brokering to be effective, considerable freedom and flexibility is needed to explore different options and linkages, which might not be possible with organizations such as government agencies, consultancies or even private companies. In addition, as emphasized earlier that innovation brokerage roles are context specific (Klerkx and Gildemacher, 2012). Thus, the MAFSC and other stakeholders such as LGAs and NGOs need to recognize the innovation brokerage roles, and build their innovation-brokering capacities by changing their institutional conditions including developing indicators for

measuring innovation that capture both tangible and intangible activities of an innovation broker for the majority to realize the potentials of innovation brokerage roles, and hence justify investment in their existence. On the other hand, other innovation champions including LGAs and private firms should also integrate the cost of innovation brokering when designing agricultural innovation projects.

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References

Abass, A. B., Mlingi, N., Ranaivoson, R., Zulu, M., Mukuka, I., Abele, S., Bachwenkizi, B. and Cromme, N. (2013). Potential for Commercial Production and Marketing of Cassava: experiences from slam scale cassava processing project in east Africa. IITA, Ibadan, Nigeria. 74pp.

Abass, A., Mbabaali, S. and Cromn, N. (2010). The untapped potential of cassava as a food security and industrial crop in eastern and southern Africa: case study of Madagascar, Tanzania and Zambia. In Okechukuu, R. U. and Ntawaruhunga 2012, Proceedings of 11th Triannuall symposium of the ISTRC –AB, held at Memling Hotel, Kinshasa, Democratic republic of Congo fro 4-8 0ctober 2010, pp. 542-548.

Anandajayasekeram, P. and Gebremedhin, B. (2009). Integrating innovation systems perspective and value chain analysis in agricultural research for development: Implications and challenges. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project Working Paper 16. ILRI (International Livestock Research Institute), Nairobi, Kenya. 67pp.

Bozeman, B. (2000). Technology Transfer and Public Policy: A review of research and Theory. *Research Policy*, 29, 627-655. http://dx.doi.org/10.1016/s0048-7333(99)00093-1.

Chema, S., Gilbert, E. and Roseboom, J. (2003). A Review of key Issues and Recent Experiences in Reforming Agricultural Research in Africa. Research Report 24. ISNAR, The Hague, The Netherlands. Available at: ftp://ftp.cgiar.org/ isnar/ publicat/ pdf/RR-24.pdf.

Creswell, J. W. (2007). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Thousand Oaks, CA: Sage. 395pp.

Dolan, C. and Humphrey, J. (2000). Governance and Trade in Fresh Vegetables: The Impact of UK Supermarkets on the African Horticulture Industry. *Journal of Development Studies* 37(2): 147-176.

Gopalakrishnan, S. and Santoro, M. D. (2004). Distinguishing between knowledge transfer and technology transfer activities: The Role of key organizational Factors. *IEEE Transaction on Engineering Management*, 5(1), 57-69. http://dx.doi.org /10.1109/ TEM.2003.822461.

Hanna, V. and Walsh, K. (2002). Small firm networks: a successful approach to innovation? R and D Management 32, 201–207. Available in: books. google .co.tz/ books? isbn= 1466638877.

Hounkonnou, D., Kossou, D., Kuyper, T. W., Leeuwis, C., Nederlof, E. S., Röling, N., Sakyi-Dawson, O., Traoré, M. and Huis, A. (2012). An innovation systems approach to institutional change: Smallholder development in West Africa. *Agricultural Systems* 108, 74–83.

Howells, J. (2006). Intermediation and the role of intermediaries in innovation. *Research Policy* 35(5): 715-728.

Klerkx, L., Hall, A. and Leeuwis, C. (2009). "Strengthening agricultural innovation capacity: are innovation brokers the answer?" *Int. J. Agricultural Resources,*

Governance and Ecology 8 (5/6): 409-438.

Klerkx, L. and Leeuwis, C. (2009). Establishment and embedding of innovation brokers at different innovation system levels: Insights from the Dutch agricultural sector. *Technological Forecasting & Social Change* 76 (6): 849-860.

Klerkx, L. and Gildemacher, P. (2012). The role of innovation brokers in agricultural innovation systems. In: World Bank (2012), *Agricultural Innovation Systems: An* Investment Sourcebook, pp. 211-230. World Bank, Washington DC. (Available at: siteresources. Worldbank .org/.../ Module3-TN4.pdf).

Leeuwis, C. and Van den Ban, A. (2004*). Communication for Rural Innovation : Rethinking Agricultural Extension.* Wageningen, The Netherlands, Wageningen Academic Publishers. 428pp.

Li-Hua, R. (2006). Examining the appropriateness and effectiveness of technology transfer in \China. *Journal of Technology Transfer in China*, 1 (2), 208-223. http://dx.doi.org /10.1108/ 17468770610670992.

Mtandao wa Vikundi, vya Wakulima Tanzania (MVIWATA) (2010). *Taarifa ya jukwaa la wakulima la wilaya – Parapanda* Conference hall. 10pp.

Perez Perdomo, S. A., Klerkx, L. and Leeuwis, C. (2010). Innovation Brokers and their Roles in value chain-network innovation: preliminary findings and a research agenda. *Innovation and Sustainable Development in Agriculture and Food.* Hal-00525268, version 1. pp. 1-13.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods*. Thousands Oaks, CA: Sage. 212pp.

Rondot, P. and Collion, M. H. (2001). Agricultural Producer Organizations; Their Contribution to Rural Capacity Building and Poverty Reduction. World Bank. 19pp.

Ruben, R., Slingerland, M. and Nijhoff, H. (2006). Agro-food chains and networks for development, (eds) 25pp.

Sumberg, J. (2005). Systems of innovation theory and the changing architecture of agricultural research in Africa. *Food Policy* 30 (1), 21–41.

Smits, R. (2002). Innovation studies in the 21st century: questions from a user's perspective. *Technological Forecasting and Social Change* 69: 861-883. Available at: books.google.co.tz/books?isbn=1609604652.

Smits, R. and Kuhlmann, S. (2004). The rise of systemic instruments in innovation policy. *International Journal of Foresight and Innovation Policy* 1 (1/2), 4–30.

Smith, A. and Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability, *Research Policy* 41. 1025– 1036.

Trienekens,.H. J. (2011). Agricultural value chains in developing countries A framework for analysis. *International Food and Agribusiness Management Review* Volume 14, Issue 2, 2011, Available at: http://ageconsearch. umn. edu/ bitstream/.

United Republic of Tanzania (2003). Agricultural Sector Development Programme Framework and Process Document. Dar es Salaam. 47pp. Available at: *www.**agriculture**.go.tz/*

United Republic of Tanzania (2013). National Agricultural Policy, Ministry of Agricultural Food Security and Cooperatives, Dar es Salaam. 42p. Available at: *www.**agriculture**.go.tz/*

Vellema, S. and Boselie, D. (2003). Cooperation and competence in global food chains: perspectives on food quality and safety. In Perez Perdomo. S. A., Klerkx. L. and Leeuwis, C. (2010), Innovation brokers and their roles in value chain-network innovation: Preliminary findings and a research agenda. *Innovation and Sustainable Development in Agriculture and Food*. Hal-00525268, version 1. 1-13pp.

Vermeulen, S., Woodhill, J., Proctor, F. J. and Delnoye, R. (2008). Chain-wide learning for inclusive agrifood market development: a guide to multi-stakeholder processes for linking small-scale producers with modern markets. International Institute for Environment and Development, London, UK, and Wageningen University and Research Centre, Wageningen, the Netherlands. 111pp.

Winch, G. M. and Countney, R. (2007). The organization of innovation brokers; an international review. *Technology Strategic Management*. 747 – 763pp.

World Bank (2006). *Enhancing Agricultural Innovations: How to Go Beyond Strengthening Research Systems*. World Bank, Washington, DC, USA. 118pp.

Available at: http://siteresources worldbank.org/INTARD/Resources/ Enhancing Ag Innovation.

Yin, R. K. (2003). Case study research: Design and methods (3rd ed.). Thousand Oaks, CA: Sage.