CHARACTERIZING AND MODELLING OF A MATCHING GRANT FOR FINANCING AGRIBUSINESS INNOVATION IN EASTERN AFRICA: A CASE OF BIOINNOVATE AFRICA

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A Thesis Submitted to the Graduate School in Partial Fulfilment of the Requirements for the Master of Science Degree in Agribusiness Management of Egerton University

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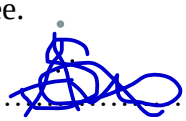
DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been presented in this university or any other for the award of a degree.

Signature: ……  …… Date: 12th June, 2023

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DEDICATION

I dedicate this thesis to my mummy Anjeline, my son Travis and my daughters: Quinter, Angie and Favour. You gave me the zeal to do it.

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ABSTRACT

Innovation financing is vital for economic diversification and growth of agribusinesses in Eastern Africa. It makes agribusiness firms more competitive and sustainable in the long run. Yet, access to innovation financing remains a challenge for most agribusinesses in the region. Investors in agribusiness innovations usually require agribusiness firms to provide matching grants (co-funding) to finance innovation activities. However, it is often not clear what these matching grants constitute for agribusinesses and investors, and how they should be executed during and after project implementation. In addition, agribusinesses matching grants preference and constraints are not known and what influences agribusiness firms' choices of matching grants are yet to be identified. This study aimed at characterising matching grants by developing a framework for costing matching grants; identifying constraints faced by agribusinesses while providing matching grants; and, established firm characteristics and institutional factors that influence agribusinesses choice of matching grants. The study utilised a mixed method research design by employing both quantitative and qualitative tools in studying agribusiness firms that are beneficiary of BioInnovate Africa phase II grants. The latter is a regional science and innovation-driven initiative implemented by the International Centre of Insect Physiology and Ecology, Kenya. An online survey of 30 agribusiness firms distributed across Burundi, Rwanda, Kenya, Uganda, Ethiopia and Tanzania was carried out, and 12 key informant interviews done as part of the study. Data was analysed using qualitative content analysis and generalised structural equation modelling (Gsem) multiple multinomial logistic model (Mml). The study developed a matching grant costing framework and, analysed constraints that agribusiness firms faced while providing matching grant. The results showed that firm size, ownership structure, management structure, location, and age significantly affected the choice of matching grants. In addition, institutional factors such as firm practices and guidelines also influenced the choice of matching grants. The study recommends the need to address the binding constraints and customise matching grant based on a firm's structure and need. The results of the study may be used to inform the policies and practices on financing agribusiness innovations for grantors and grantees. The recommendations may be taken by investors and used to guide in allocation of innovation grants to agribusinesses in Eastern Africa.

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LIST OF ABBREVIATIONS AND ACRONYMS

AU	African Union
AUDA	African Union Development Agency
BA	BioInnovate Africa
CAADP	Comprehensive Africa Agriculture Development Program
Gsem	Generalised Structural Equation Modelling
ICIPE	International Centre for Insect Physiology and Ecology
IFAD	International Fund for Agricultural Development
Mml	Multiple multinomial logistic
NEPAD	New Partnership for Africa's Development
PAC	Programme Advisory Committee
PMO	Programme Management Office
PPP	Public Private Partnership
R&D	Research and Development
SADC	South Africa Development Community
SAIS2	South Africa Innovation Support Program Phase II
Sida	Sweden International Development Cooperation Agency
SMEs	Small and Medium Enterprises
STISA	Science and Technology Innovation Strategy for Africa
UNSDG	United Nations Sustainable Development Goals
USAID	United States Agency for International Development
USD	United States Dollar
WBG	World Bank Group

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The worlds' population was estimated to 7.8 billion people in 2019 and is expected to rise to 8.5 billion by 2030 (United Nations, Department of Economic and Social Affairs, 2019); the urban population is expected to rise to 5 billion by 2030. Africa is the fastest growing continent with a population of 1.34 billion people, and is estimated to rise to 1.69 billion by 2030. Half of Africa's population is estimated to live in urban areas by 2030 (United Nation, 2019). This will exert excess pressure on the need for safe, processed and nutrition requirements especially in cities and towns (Cooperate Social Responsibility [CSR] ASia, 2017). Agro-processing levels in low-income countries such as Sub-Saharan Africa (SSA) is estimated to be 38% compared to high-income countries of 98% (United Nations Industrial Development Organization [UNIDO], 2019).

In order to address the challenges encountered with the growing population, urbanization and the 2030 United Nations Sustainable Development Goal (UNSDG) number 9 that aims to promote industry innovation and infrastructure, agribusinesses must be centred in food production by adopting agro-processing innovation technologies that are cost effective, highly productive and suitable to the changing environment (African Union Commission [AUC], 2014; CSR Asia, 2017) (African Union Commission [AUC], 2014; CSR ASIA, 2017). Hence, there is need for stakeholders involved in agribusiness innovation to actively cooperate in developing and investing in innovation technologies, review existing policies and develop viable business models geared towards attaining inclusive economic growth (Food and Agricultural Organization [FAO], 2019).

Agribusiness growth is estimated to be two to four times more powerful in reducing poverty and increasing development than any other sector of the economy (CSR Asia, 2017). Africa is endowed with great agribusiness opportunities. However, these opportunities are yet to be harnessed to their full potential due to lack of institutional, technological and environmental support to agribusiness innovation. Innovation and private sector investment in agribusiness are identified as the major drivers that spur inclusive economic growth and job creation (FAO & ECA, 2018). Success hinges on clearly identifying and connecting the drivers and processes that are essential for unlocking agribusiness innovation and could trigger the desired economic

development in the region. Agribusinesses involved in the agro-industrial activities such as manufacturing and distribution have shown a stable growth for the past two decades (Government of Kenya [GoK], 2012). Thus, a greater opportunities for stabilising and strengthening inclusive growth via agribusiness manufacturing which entirely calls for innovative technology and adequate financing (GoK, 2012).

Agribusiness firms face unprecedented challenges that affect human livelihood and environmental sustainability. These challenges are largely shouldered by the smallholder farmers due to their susceptibility to advanced weather patterns and inadequate financing to acquire advanced innovative technologies. Although large-scale agribusinesses can mitigate against these risks through accumulated savings, enterprise diversification, and attracting credit from financial institutions, reports on agricultural credit extension indicates that it is way far much below the sector's requirement (Miller *et al.*, 2010).

Agribusiness firms finance their projects through equity financing or debt financing. Equity financing require the exchanging potions of ownership of businesses to investors. Sources of financing under this category include: personal saving, friends and relatives, venture capital, government grants, equity offerings, warrant and initial public offers. Debt financing involves borrowing funds from creditors such as, banks and commercial lenders, commercial finance companies, government programs, bonds and lease (Eniola & Entebang, 2015; Freeman *et al*., 2016).

Agribusiness financing agribusiness is challenged by inability of the agribusinesses to meet the prerequisites set by financial institutions for credits and inability to provide required collateral to secure credit (Freeman *et al.*, 2016). Other challenges that limit agribusiness innovation financing include lack of consistent income; lack of value chain aggregators, lack of developed market, poor infrastructure, poor record keeping as a proof of their investment and lack of extension services (World Bank, 2016).

Globally, the urge to develop policies that support agribusiness innovation financing has been on the rise, for instance, the 17 United Nations Sustainable Development Goals (UN SDGs) 2030, the New Partnership for Africa's Development (NEPAD) (now known as the African Union Development Agency-New Partnership for Africa's Development (AUDA-NEPAD), the Comprehensive Africa Agriculture Development Program (CAADP) and African Union Agenda 2063 (NEPAD/ CAADP, 2009). It is important to note that, despite the advancement in policy

development, no single organization can achieve the United Nation's 17 SDGs by working alone. Governments, private sector, civil society organizations, farmers' organizations and research bodies all have a role in creating a conducive environment for agribusiness innovation (GoK, 2018).

Agribusiness innovation has the capacity to spark off the desired sectoral transformation. Innovation is what keeps agribusinesses at a competitive edge over their competitors. It is therefore, important to understand how agribusinesses fund innovation technologies. Currently, the world is experiencing a widening gap as far as funding of agribusiness innovation is concerned (Fuglie *et al.,* 2019*)*. Government budgets for financing agribusiness innovation with public money also keeps on shrinking proportionately every year (Fuglie *et al*., 2019). Though public-funded research is key in the innovation pathway, it cannot fill the investment gap that is required. Moreover, it lacks proper mechanisms to link research and innovation development to potential markets. Thus, the government is forced to engage with development agencies and private sector companies to develop alternative ways of financing agribusiness innovation (IBAN & BoP, 2018).

Private sector is significant in innovation pathways and in realising inclusive investment in agribusiness. However, they are reluctant to commercialise new innovative technologies due to the numerous unforeseen coordination and market failures. Agricultural research institutions use competitive grants and smart input subsidies for small scale farmers to scale up innovation technologies and Public Private Partnership (PPP) (Greijn *et al*., 2013; IBAN & BoP, 2018).

Agribusiness financing is perceived to be risky and costly, thus, limiting the commercial banks' lending to the sector (Ngare *et al.,* 2015). For instance, in Kenya, agribusiness sector only receives 3% of the total credit extended to the economy (Ngare *et al.,* 2015). On the contrary, in developed countries major banks and large financial credit such as Rabobank in the Netherlands and Banorte in Mexico, expressed the view that agricultural credit is profitable if producers are well integrated into viable value chain (Miller *et al.,* 2010). The quest for financing agribusiness innovation by commercial banks is on the rise. However, their growth will still depend on the supply side and/or demand side of the credit provision (Ngare *et al.,* 2015).

Considering the challenges that agribusinesses face in accessing credit, funding of agribusiness innovation has proved to be a hard nut to crack. This is because, first, innovation requires a combination of creativity, problem solving skill and ability to think outside the box. Second, there are numerous innovation roadblocks in agribusiness. Third, the possibility of failing

to achieve the desired target. Currently, funding of agribusiness innovation is heavily dependent on the international donor agencies who have raised their terms and conditions to funds eligibility. Key among the requirements is the provision of matching grants by the beneficiary.

According to International Funds for Agricultural Development (IFAD), matching grants is defined as - a one-off, non-reimbursable transfer to project beneficiaries. It is based on a specific project rationale and on the condition that the recipient makes a specified contribution for the same purpose or subproject (IFAD, 2012). Matching grants are also referred to as co-funding, matching support, charity support or community's contribution. Matching grants is normally provided in-kind by providing staff, infrastructure and any other organizational support, and/or direct financial support. However, the details of the matching grants constituents, how to operationalize them and what influences the choice of matching grant is not clearly defined in literature or in the ongoing projects.

Ireland and Europe were the first to try matching grants policy in early 1960. World bank's first trial was in India and Indonesia in 1986 (Phillips, 2000). Since then, over a 100 World Bank and other renowned international projects have embraced the use of matching grants component in allocating grants (World Bank, 2016). Matching grants have been one of the most common policy tools used by governments and development partners to allocate grants to different SMEs, taking into consideration the aspects of competitiveness and growth. Though matching grants remains the most popular tool for private sector development interventions, institutions have experienced challenges of implementation and insufficient evidence of their effects on project execution and performance (World Bank, 2016). In addition, Phillips (2001) affirmed that there was no single matching grants model recommended for any institution. Thus, funders must customise their own from a variety depending on their scope and objectives.

Africa agribusiness have majorly relied on development agencies to fund their innovation. Apart from the World Bank, other international organizations that use matching grants to promote innovation and competitiveness include World Food Program, IFAD, United States Agency for International Development (USAID), and Swedish International Development Cooperation Agency (Sida). The urge of seeking for food security and economic inclusivity demand viable investment opportunities through Public Private Participation (PPP) that call for co-financing among the stakeholders (Greijn *et al*., 2013). In Africa, Southern Africa Innovation Support Programme (SAIS 2) is an example of project that requires matching grants form beneficiaries in

order promotes the growth of start-up businesses through strengthening innovation ecosystems and promotion of cross-border collaboration between innovation role-players. It was supported by the Ministry for Foreign Affairs (MFA) of Finland, in partnership with the ministries responsible for Science, Technology and Innovation of Botswana, Namibia, South Africa, Tanzania and Zambia, and the Southern African Development Community (SADC) Secretariat. (SAIS 2, 2018). SAIS 2 provides opportunities to students, technologists, start-ups and citizens to participate in employment and value creation everywhere in the world. SAIS 2 was anchored in the regional integration policies outlined in SADC strategies of industrialisation, innovation and youth empowerment.

The programme covers three thematic areas referred to as windows: Developing Institutional Capacity for Regional Innovation Cooperation; Scaling Enterprises through Stronger Innovation Support Organisations; and Inclusive Innovation. In window 1 and 3, SAIS 2 requires 20% matching grants in cash and/or in kind. While in window 2 the beneficiary is required to provide 10% matching grants in cash and 10% in-kind. The 10% cash was provided as bank guarantee while 10% in-kind provided during project execution and was to be reported in the financial statements (SAIS 2, 2018)

The second example is Agri-Business Capital (ABC) Funds that operates in Sub-Saharan Africa South and South-East Asia, and Latin America. The program attracts innovative approach in the rural areas through development of agribusiness value chain systems. The fund provides loans and equity to rural SMEs, farmers' organizations, agri-entrepreneurs and rural financial institutions targeting employment of youths and women in rural areas and projects that enhance climate smart and productivity.

In Eastern Africa, Kilimo Trust that was one of the grants that operated in 6 countries in Eastern Africa whose core functions were: commercializing technical innovation; building institutional Public-Private Partnership: and, enhancing market support infrastructure (Freeman *et al*., 2016). One Acre Fund is another matching grant programme operating in Kenya, Uganda, Malawi, Rwanda, Tanzania and Burundi. Global Investment Fund (GIF) co-fund key areas such as testing and scaling up of new farming innovations and supports ecosystem adoption and improvements through either government partnerships and/or private sector agribusinesses.

The third example is BioInnovate Africa (BA) is. It is a regional science and innovation-driven initiative implemented by the International Centre for Insect Physiology and Ecology (*icipe*), and

located in Nairobi, Kenya. The programme is funded by Sweden International Development Cooperation Agency (Sida). The programme encourages multidisciplinary teams of scientists from NGOs, Community Based Organizations (CBOs), universities, research institutions and entrepreneurs to identify biobased near market technologies that are economically feasible. In addition it supports scientists, researchers, entrepreneurs and innovators in the region by linking biological based research ideas and technologies to business and markets in Eastern Africa: Ethiopia, Kenya, Rwanda, Tanzania, Burundi and Uganda (International Centre of Insect Physiology and Ecology [*icipe*], 2017).

BioInnovate Africa Programme aims to improve the productivity of smallholder farmers and communities in Eastern Africa by making agro/bio-processing a more competitive and environmentally sustainable enterprise through appropriate business models. This is done through provision of grants, policy analysis and promoting bio-business incubation programmes. The programme is aimed at using biobased technologies in enhancing smallholder farmers and community livelihood. The programme is aimed to address three core values: value addition to agro-produce and related bio-resources; agro/bio-waste conversion in support of environmental sustainability and biobased healthcare products. The programme is governed by Programme Advisory Committee (PAC). Daily duties are run by the Programme Management Office (PMO) in Nairobi.

Agribusiness firms under the study were competitively selected by the PAC upon aligning their innovative technologies to the 3 core mandates. The programme welcomes call for complementary funding from private, public and collaborative partners in every phase. Agribusinesses selected are collaborate with public research institutions, universities and other private firms both at national and regional levels within Eastern Africa. Agribusinesses in the study play a key role in the product value chain at production, manufacturing and distribution. BA programme provided 75% of the total budget of the total while the beneficiary firms provided 25% as matching grants. These matching grants were provided either in-kind and/or cash in the process of implementing specific innovative projects (*icipe*, 2017). The details of the firms, projects and country of operations are as in Appendix 2.

1.2. Statement of the problem

Matching grants are becoming popular instruments used by investors to support agribusiness innovations and entrepreneurship. However, it is often not clear what these matching grants constitute for agribusinesses and investors, and how they should be executed during and after project implementation. In addition, agribusinesses matching grants preference and constraints are not known and what influences agribusiness firms' choices of matching grants are yet to be identified. Matching grants in project financing are seldom reported and have not been sufficiently studied so that a protocol can be developed for their implementation. Consequently, matching grants tend to remain only on paper. There is currently no well documented mechanism for administering matching grants especially in financing agribusiness innovation. The study, therefore used a case of BioInnovate Africa to evaluate and document firms' characteristics and institutional factors that influence a firm's choice of matching grants.

1.3. Objectives

1.3.1. General objective

To contribute to the enhancement of technology adoption through effective matching grants model for financing agribusiness innovations.

1.3.2. Specific objectives

i. To characterise types of matching grants provided by agribusiness firms.
ii. To analyse constraints experienced by agribusiness while providing of matching grants.
iii. To determine the firm characteristics that influence the choice of matching grants by agribusiness firms.
iv. To determine the institutional factors that influence the choice of matching grants by agribusiness firms.

1.4. Research questions

i. What are the characteristics of matching grants provided by agribusiness firms?
ii. What are the constraints agribusinesses face in providing matching grants?
iii. How do firm characteristics influence the choice of a matching grants for agribusiness firm?

iv. What are the institutional factors that influence the choice of a matching grants for agribusiness firm?

1.5. Justification for the study

Agribusiness sector is capable of using creativity and resources to deliver real time solutions to the global, regional and national challenges. However, for agribusiness to play these roles, productivity drivers such as agribusiness financing, innovation and partnership cannot be ignored. Agribusiness financing has been regarded as risky and costly to lend sector by the commercial lenders while personalised lending remains limited leaving the industry to rely on governments and international development agencies for support of its goals. Investors have endorsed the provision of matching grants as key requirement for funds eligibility.

Empirical literature emphasises the need to customise a matching grant model depending on the project objectives and the prevailing circumstances (World Bank, 2016). A good understanding of matching grants in financing agribusiness innovations was thus necessary to both the grantees and grantors. This will help investors determine the matching grants rate and the beneficiary have an easy time in operationalising the policy. This study aimed to use the case of BioInnovate Africa and tailor an effective matching grants model that will inform policy and practise of allocating innovative grants to agribusinesses in Eastern Africa.

The study was in line first with the UNSDGs number 9 that aims to promote industry, innovation and infrastructure that is directly linked to poverty reduction food security and job creation. Second, the UN SDGs 2030 that identifies innovation as a significant tool for achieving the SDG. Third, AUDA-NEPAD that identified agribusiness as central point to poverty alleviation, food and nutrition security. Fourth, the CAADP pillar 4 that provides a common framework for stimulating and guiding national, regional and continental initiatives on enhanced agriculture productivity through agricultural research and systems to disseminate appropriate new technologies. Fifth, the African Union Agenda 2063, that enhances investment finance in public and private agriculture by allocating 10% of public expenditure to agriculture and committed to ending Hunger in Africa by 2025 (The African Union Commission, 2015). Finally, the Science Technology and Innovation Strategy for Africa (STISA) 2024, that seeks to eradicate hunger and ensure food and nutritional security through a multidisciplinary and multi-sectoral approach to collaborate open innovation and entrepreneurship in Africa (AUC, 2015).

1.6. Scope and limitation of the study

BioInnovate Africa offers grants and incubation programmes to universities, research partners, public institutions and agribusiness firms. The study only focused on the agro-processing firms that are beneficiaries of BioInnovate Africa Phase II grants in Eastern Africa. Initially, the interviews were intended to be done in the 6 countries. However, due to the cost implication and Ministry of Health protocols on COVID-19, key informant interviews were carried out only in Kenya, where online, phone and in-person interviews were conducted. This might have caused a slight variation especially while collecting qualitative data. However, some of the qualitative parameters in the study were included in the online survey to minimise the variation.

1.7. Operational definition of terms

Agribusiness firms - These are agro-processing firms involved in the vertical integration of agricultural produce by transforming agricultural products, value addition and distribution through various channels to the final consumers of the product.

Agribusiness innovation - It is a process of developing and putting to market new or improved goods and services, or new forms of organisation, institutions and markets in order to enhance effectiveness, competitiveness and resilience to environmental sustainability.

Matching grants -Also referred to as co-funding, matching support, charity support or the community's contribution to the project provided either in-kind, cash or a combination of cash and in-kind by the beneficiary.

Matching grants schemes- Refers to the projects that include matching grants element as a mandatory requirement for a grant. It is the combination of the investors' contribution and the beneficiary's contribution to the total worth of the project.

Public Private Partnership - This is a collaboration between public or government agencies and private firms aimed at financing and building projects. For this study, public referred to BioInnovate Africa, private to agribusiness firms.

CHAPTER TWO

LITERATURE REVIEW

2.1. Overview of matching grants

Matching grants can be traced back to 1960. Irish Export Board was the first to use the matching grants scheme for a marketing development fund that was intended to promote exportation of the Irish products to other countries. In the 1960s, matching grants projects were established in Europe, the United Kingdom, France and Italy. The matching grants Schemes were intended to encourage firms of less than 400 employees to use management consultation services. The results were very encouraging with 90% of the beneficiaries stating that they had received value for money and 74% ready to pay the full market price for the consultation services (World Bank, 2016).

This experience prompted the World Bank and other development banks to include matching grants as a key instrument in most projects. By 1986, 16 banks had established matching grants projects to support business development and promote export. Indian Engineering Export Development Project was the first project to include matching grants in 1986. The scheme contained both consultation funds and productivity funds. It required 50% matching funds and a single firm could receive up to $ 200,000 from the World Bank. Even though not all the funds were disbursed, the project was rated successful since the export growth rate of the beneficiaries surpassed the national growth rate (Freeman *et al*., 2016).

Another case was in Indonesia in 1986, where $8 million was provided. The funds were intended to support exports by purchasing small equipment, offer technical assistance to the firms, promote marketing, and support in the management and training of the staff. The funds were given to selected firms. The firms were required to provide matching grants of 50% or above. Even though grants processing procedure delayed funds disbursement of up to 68% at the end of the project, the advisory services were successful, and export increased by a multiple number in the grant amount. Despite the achievement, the beneficiary firms were not prepared to pay the full price of the services after the project withdrew. There was limited impact on the market creation leading to doubts of the project sustainability (Phillips, 2000). By 1987, approximately 600 projects with matching grants instruments had been implemented.

In 1989, as a follow up to the previous lessons learnt in India, 4 funds totalling $20 million were established with each firm receiving a grant of $500,000. The project was rated successful with a tremendous increase in the export. The project used Indian Banks as the administrators of the funds. This in itself introduced the firms to an alternative and parallel loan facility to finance their fixed assets and working capital in addition to the grants that were financing advisory services (World Bank, 2016).

Key lessons learnt from the Indian and Indonesia projects were the need to establish an export policy framework, have an autonomous management for the project that is free from government or political interference and develop adequate internal controls. Even though the projects experienced challenges of evaluation and implementation, they were rated successful. This led to similar projects being established in Latin America in 1990 and in Kenya in 1991 that incorporated matching grants instruments (Campos *et al.,* 2014).

Unlike the previous trend of matching grants projects in Kenya, Indonesia, and Argentina that focused on exports promotion, the projects in Mauritius were more concerned with the broader perspective of business services and productivity. Even though the initial disbursement was slow, the project reported high ratio of revenue and export sales that were associated with the grant funding. The projects also reported weak additionality effects in large firms. The large firms are already aware of how to access the funds required and are accustomed to pay for the cost (The World Bank, 2010). Therefore, matching grants funds are likely to be marginal to the large-scale firms than in the small firms hence the additionality effect is likely to be experienced more in small firms.

Since 1986, the World Bank has implemented over 100 projects with the matching grants instrument inclusive, most of the projects supporting SMEs and private sectors. As from 1996, a significant percentage of these projects supported agriculture and rural development. This proportion significantly rose until 2010. From 2011, even though the proportion of the agricultural projects declined, the total grant finance increased almost two times those in the non-agricultural sector (World Bank, 2016).

In 2012, it was reported that out of 106 private sector matching grant projects that had been supported by the World Bank, 21 targeted agricultural sectors (World Bank, 2016b). Closed agricultural project funds amounted to $ 45 million compared to closed non-agricultural sectors of $ 8 million. The difference was attributed to the fact that agricultural matching grants projects

allowed the purchase of equipment which is contrary to non-agricultural projects. In addition, agricultural projects used the collective approach in the provision of technical assistance and equipment. The matching grants projects were used to improve agribusiness product quality and productivity, reduce post-harvest losses and advance technology along the value chain on a long-term basis (The World Bank, 2010).

The World Bank review of the matching grants projects noted that for the past 2 decades, the proportion of matching grants supporting agriculture had been on the rise. Africa was the second by volume of matching grants projects after Caribbean. Matching grants projects in agribusiness addressed varied market failures and objectives compared to the ones in traditional private sector development. For example, Mali agricultural competitiveness and diversification project (P081704, FY06–15) provided 70% of the equipment cost that were necessary for the new and improved technologies for irrigation or post-harvest technique. It justified that the projects' cost was above the self-financing capacity of smallholders and could not attract credit due to the long amortization cost. Though the project financed 125 SMEs, documentation on impact and sustainability were questionable (World Bank, 2016).

The second example was the Zambia agricultural development support program (P070063, FY06-14) which aimed to advance smallholder agribusiness along value chains. The matching grants facilitated the development of innovative business linkages between smallholders and other actors along the value chains. The grant considered three main categories of windows with a varying degree of match: 50% on extension and technology transfer, 40% on pilot studies, 25% collective approach on capacity building. At the end of the project 30 innovative technologies were introduced within 29 projects direct to the smallholder farmers or along the value chain. The project reported some impact regarding access to the export market but with limited effects on technology adoption and sustainability (World Bank, 2016). Studies have shown that even though access to commercial finance component was a requirement in most projects, it played little role in the assessment and ranking of success of agriculture matching grants project (The World Bank, 2007).

The IFAD (2012) guidelines for matching grants provides recommended levels for matching grants. In general, it is recommended that where goods supported have: a purely public benefit, minimum contribution of about 10% is required to encourage ownership, commitment and sustainability. A public utility that generates business, 20-30% match is required; innovation and

adoption of technologies, 20-40% match is required; and ventures that generate income for private benefits require higher levels of match possibly ranging from 40-90% (IFAD, 2012). The guidelines further stipulate that the closer the business association to private for-profit, the higher the expected match, the lower the match, the lower the beneficiary ownership, the higher the interest from the local politicians and the faster the disbursement rate. The reverse is true for the higher match. The guidelines further mentioned the need to assess the beneficiary knowledge, willingness and capability to make the required contribution (IFAD, 2016). From the matching grants projects studied, reports and review indicated that there are possibilities of emerging good practice to address the weaknesses of matching grants as an instrument.

2.2. Justification for using matching grants in agribusiness

Agribusiness matching grants projects frequently facilitate demand-driven services and development. They mainly target farmer groups and agribusinesses along the value chain. They aim at increasing smallholder's income or profitability; strengthening collaboration and developing partnership, improve access to sources of finance and competitiveness. In the matching grants scheme the organizational funds are matched with the beneficiary funds. In most cases, the financing organization oversees administration of the project while the beneficiary firm is fully entitled with the execution role of the project (The World Bank, 2010). It is observed that most matching grants that finance agribusinesses or farmer groups are not as competitive as those targeting the non-agricultural sector. The funders normally endorse the firms that meet the minimum requirements. In the past matching grants schemes were used to finance research projects, this trend has shifted to promoting near-market technology generation and technology adoption, by emphasising on collaboration (The World Bank, 2010).

In general, matching grants schemes are justified for public co-funding when it targets more on the public good character of an investment such as agricultural research and development, and social infrastructure. However, investment in private good targeting economic infrastructure can only be justified when it results into positive externalities and spillover effect or concerned with poverty reduction (IFAD, 2012). The justification is stronger when it is concerned with the groups' interests such as productivity, post-harvest losses, capacity building and technological advancement (Sberro-Kessler, 2017).

2.3. Alternative instruments to matching grants

Donor funding varies depending on their mission. The funding is provided in the form of aid, soft loans, philanthropy, industry grant or government grant. Each type of fund defines the instrument to be used such as vouchers, sub-loans, business plan competition and reimbursable instruments. The instruments are required to demonstrate the beneficiary commitment, ownership, risk sharing and sustainability. The type of instrument used depends on objectives of the project, the funders' preference and the prevailing condition.

Vouchers are subsidies to transactions that are expected to promote demand by lowering the service cost in relation to its real value by providing liquidity directly to the user (Phillips, 2001). Voucher schemes are administratively complex and require close management since they can easily be converted to cash pausing a risk of collusion and rent seeking behaviour. The first successful voucher scheme was tried in Paraguay in 1995 by the International Development Bank. The second example was the Kenya Micro and Small Enterprise Training and Technology Project (P001353, FY1994–2003) funded by the World Bank. The training was not implemented due to inadequate control of rent seeking behaviour.

The second instrument is sub-loan that are normally provided at the market rates. Jamaica Private Investment and Export Development Project (P007485, FY1994– 2001) is an example. The project provided a soft loan and financed up to 80% of the export development plan. This program eventually was changed to a matching grants due to the difficulty to guarantee the sub-loans. Vietnam Inclusive Innovation Project (P121643, FY13) is the second example. It contained both the sub-loan and the matching grants instrument that was administered through financial institutions. The project was unsuccessful due to excess liquidity in the banking system (World Bank, 2016).

Business plan competition is the third instrument that aims to arrive at the best solution to a particular scenario competitively. YouWiN! Competition of Nigeria under the project Nigeria Growth & Employment Project (P103499, FY2011) is an example. The program aimed to arouse the youth entrepreneurial skills through mentorship, training and equity financing. The project reported lasting solutions such as increased profits, job creation and increased sales (McKenzie, 2017).

The Reimbursable instrument is the fourth one. The instrument is used majorly to finance lumpy investments projects that are far beyond the beneficiary financial capability. After the

investment picks up, the firm is expected to reimburse either in full or partially, once or routinely the grant amount. Mauritius Manufacturing and Services Development and Competitiveness Project (P112943, FY10–13) combined the reimbursement instrument with the MG instrument. The project was never implemented due to change in Mauritius government agenda (The World Bank, 2010).

2.4. Constraints encountered with matching grants schemes

Phillips (2001) did the first study that critically examined matching grants schemes where 10 World Bank funded projects were reviewed. Based on experience, some of the challenges that were affecting matching grants schemes especially in developing countries were identified. The study noted that justification for a market failure was poorly done in most of the projects analysed. The matching grants projects generated positive externalities by lowering the cost of products and contributing to the consumers' welfare (van der Meer & Noordam, 2004). Even though the firms' return on investment in terms of sales and profitability increased, it lacked clarity on effects of additionality and sustainability of the project due to lack of appropriate tools for measurement. The study also noted that generally most projects operated at high costs and slow take offs (Ton *et al.*, 2011).

Phillips, therefore, came up with the following recommendations: first, there was need to establish an economic justification for the projects based on the prevailing condition. It was necessary to clearly scrutinise the justification provided by the beneficiary and determine the indication of the market failure (van der Meer & Noordam, 2004). The challenges that are concerned with macroeconomic, trade policy reforms and administrative reforms may not be solved by the provision of matching grants schemes. Second, Phillips recommended the need to establish a local ownership of the project. There was a need to draw the attention and an understanding of the government to matching grants schemes. He emphasised the need for autonomy, a streamlined management, internal controls and safeguard against grant abuse. The study further recommended the need to design matching grants that are cost-effective. Finally, the study highlighted key eligibility and management principles that should be considered to streamline disbursement procedures and target firms with the highest potential for spillover and additionality effects (Phillips, 2001).

The Independence Evaluation Group and World Bank Group (2014) in the comprehensive review concluded that even though matching grants schemes were becoming popular as one of the best tools to support SMEs, it was challenged by implementation difficulties. Furthermore, the matching grants projects were weakly justified (IEG & WBG, 2014). In 2016, WBG review of matching grant projects indicated that without a comprehensive economic analysis of the market failure, there is a possibility of encountering limited additionality and spillovers, weak demand and disbursements, unintended consequences on the business development services market or unsustainable impact if the project does not address binding constraints for SMEs such as access to credit (Horst & del Mar Polo, 2016). It is important to note that matching grants schemes by their design and nature are not sustainable instruments, they are only supposed to aid sustainable developments.

2.5. Effect of matching grants schemes

Matching grants schemes have been known to promote consumption by lowering the price of goods and services. This, in turn, induces the supply side of the economy by expanding production in an effort to meet demand (van der Meer & Noordam, 2004). Matching grants schemes stimulates innovation, technology adoption and asset building that provided the financial cushion in times of economic shocks and serves as springboards for investment (Horst & del Mar Polo, 2016). Piza (2016) reviewed the literature on the impact of SME development interventions in low and middle-income countries and concluded that matching grants scheme were able to improve the performance of the firm and increase job opportunities. The study further noted that matching grants schemes were able to steer private investors to invest in areas that had a great potential that were generally viewed as risky or costly because of the financial, technological or institutional barriers (Piza *et al.*, 2016).

Despite the above benefits, matching grants schemes have been under scrutiny over their effectiveness in financing (Horst & del Mar Polo, 2016). Studies have shown that there is limited vigorous evidence to show the effectiveness of the matching grants schemes. This has been associated with a lack of appropriate tools to account for their effect in the economy. World Bank Group review in 2014 stated that experience has shown that matching grants schemes rarely yield the type of broad and durable economic benefits that would justify the subsidization of private enterprises with public funds (Campos *et al*., 2014).

Matching grants schemes have been found to cause a crowding out effect of financial institutions and private investment by subsidizing investment that would have been provided even without subsidy. Matching grants cause market distortion when public resources are used to projects that are non-viable or non-feasible (IFAD, 2016). In addition, during the execution, it is reported that MG projects incur excessive costs in implementation thus making it extremely difficult for the project to be self-sustaining after the project windup (World Bank, 2016).

Even though matching grants schemes are used to substitute the well-functioning of the financial markets, studies have shown that they do not work as enablers of the financial markets. Phillips (2001) recommended the design of the matching grants schemes to include the linkage of the beneficiary to the commercial financial institutions so that should the donors withdraw, their future financial needs can be taken care off. Most studies limited their studies to pre and post project implementation and used single indicators such as increase in sales, increase in productivity, without comprehensively looking for a broader impact such as job creation, profitability, product innovation, market concentration.

2.6. Firm characteristics and financing

According to Hisrich *et al.* (2016) SMEs are challenged in accessing external financing. Ramadani (2014) identified venture capital as one of the promising source of financing small enterprises concerned with new technological innovation. These technologies are associated with high risks but should they penetrate the market, then there is a likelihood of realising comparatively huge profit margins from their competitors. Ramadani (2014) emphasised that survival of SMEs is linked to the financing opportunities available for both long term, medium and short-term uses (Eniola, 2017). Informal venture capital finance most of the innovation enterprises that have a high potential of penetrating the market and achieving high growth levels while institutional venture capital, concentrate on extraordinary enterprises that are already to contribute their skills, resources, networks and ability in order to build their organization. They can contribute this by either providing inform of cash or in-kind.

Nonetheless, venture capital have limitations, they are selective and only deal with a few enterprises after considering and short-listing projects that prove to have higher growth potential and reasonable cash out (Eniola, 2017). Subsequently, SMEs in agribusiness sector tend to heavily rely on equity and debt provided by investors, entrepreneurs, government, well-wishers, sponsors,

debt from commercial financing institutions, and trade credit. Therefore, venture capital is not suitable for the vast majority of new ventures or small firms (Eniola, 2017; Hisrich *et al.*, 2016).

Robb and Wolken (2002) affirmed that the size of the firm, years in age, and ownership structure influence the firms' financial decision making. Likewise, a study conducted by Dana (2010) approved Robb and Wolken (2002) findings. The study highlighted that many enterprises are inefficient due to the inability to access credits and poor network with already established firms to enhance credit capital and entrepreneurial skills. Moreover, the researcher noted that firm characteristics disadvantages expose the firm to vulnerable economic failures (Eniola, 2017).

2.7. Firm characteristics

Firms' characteristics can be described in two ways: firm resources and organizational objectives. According to Mgeni and Nayak (2016), firm characteristics and objectives can be analysed by structure, market and capital of various firms. Kristiansen *et al*. (2003) categorised entrepreneur characteristics in to four: firm characteristics, management and know-how, customer and markets, resource and finance, and external environment (Indarti & Langenberg, 2005; Kristiansen *et al*., 2003; Mothibi, 2015; Swierczek & Ha, 2003; William *et al*., 2005).

Firm characteristics influences the adoption rate of a firm to new and improved innovation techniques. Larger firms have an advantage over small firms in terms of the capital structure, borrowing ability, ownership structure, credit financing avenues and an experienced decision making (Eniola, 2017; Eniola & Entebang, 2015). Nevertheless, Islam *et al.* (2011) confirmed that the firm characteristics such as age of the firm, firm size, and capital source were not be significant factors in the enterprise performance. Rossi *et al*. (2015) found a correlation between the size of the firm and the financial decision making (Eniola, 2017). Moreover, Akande *et al*. (2011) conducted study on the strategic effect of age, size and sources of funds on micro enterprises in Nigeria and confirmed that age, size and financing sources were significant (Eniola, 2017; Mac an Bhaird, 2010). Mahfoudh (2013) and Mwaebia (2017) found out that firm size, firm age, and liquidity were positively related to a firm's financial performance.

This study utilized the structural firm characteristic category: age, size, ownership, location and organization structure. The study's interest was to find out how particular firm characteristics influence the choice of matching grant.

2.7.1. Firm age

Firm age refers to the period by which a firm has been in operation since its establishment. Ideally, profit generation is a function of scale. Large firms are capable of acquiring a large asset base over time and making huge profit margins in comparison to smaller firms. Empirical studies have proved that age of an enterprise determines the firm's financial sourcing choice (Eniola, 2017) . Mac an Bhaird (2010), Mac an Bhaird and Lucey (2011) and Eniola (2017) established that age combined with proficiency and candidness play a positive role in accessing public equity or long-term debt financing. Age has an effect on a financial decision making and experiential learning of entrepreneurs. Solomon and Tomczyk (2008) and Eniola (2017) established that accumulation of a firm's financial resources increases with age.

Lending institutions are cautious while offering credits to newly established firms for they require owner's personal assets as a security for the loans. The lending institutions perceive the newly established firms risky in terms of long-term debt financing. In addition, SME's have difficulties in accessing external lenders since they demand securities from the owner or the firm (Eniola, 2017). This is demonstrated by their higher rates of insolvency and thus more susceptible to failure in comparison to older firms (Cressy, 1996; Keasey & Watson, 1994; Mac an Bhaird, 2010).

Research has also shown that access to financial resources, experiential learning, accrual of financial resources increase with respect to the age of the firm (Eniola, 2017). Kisengo and Kombo (2012), Mabula (2019) and Mwaebia (2017) established that older firms have gained a competitive advantage in terms of efficiency and effectiveness since with time they acquire quality and experienced manpower. A study done by Ganyaupfu (2013) and Mwaebia (2017) reported a direct relationship between the firm age and financial performance within different age categories. Even though older firms had economies of scale advantage, they are slow in embracing new technology. This could be a hindrance in accessing finance. This was also supported by Omondi and Muturi (2013) and Mwaebia (2017) who observed that older firms had developed long term technical skills that work to enable them access and manage their finances.

Contrary, firms at an early stage of operation have difficulties in accessing finances due information disparities. As the firm continues its operations, they are likely to create a reputation on credit history over time that enhances access to debt and equity finance. Mabula (2019) and Reuben Kira and He (2012) discovered that firms with less than 5 years in operation are less likely

to rely on debt financing from lenders. In addition, younger firms experience more constraints in accessing external financing due to information asymmetry. Moreover, Kira and He (2012) revealed a hypothetical existence of a positive relationship between firm's age and access to both debt and equity financing.

2.7.2. Firm size

Firm size is of key interest to research and policy when evaluating firm economic significance. Firm size has been considered by many researchers in explaining different types of leverage in a sample. Even though Balakrishnan and Fox (1993) argue out that firm-specific features are more crucial than structural characteristics in an industry, empirical studies of SME's have shown that firm size is a vital factor to consider while making decisions such as where to borrow, how much to borrow, and for what purpose (Mac an Bhaird, 2010; Mac an Bhaird & Lucey, 2011; Prahalad & Hamel, 2006).

There are 4 ways of establishing the size of the firm: asset base of the firm, level of infrastructure, sales and number of employees (Ganyaupfu, 2013; Mothibi, 2015; Mwaebia, 2017). The study utilized the number of employees per firm due to the fact that it has proven to be more consistent and a stable measure across all industries and time (Coad & Hölzl, 2012; Davidsson & Delmar, 1997; Karlsson, 2020).

Ideally, there are two ways of working with firm size; as a continuous estimator or as a discrete estimator. Since the study aimed to establish the general relationship of the firm size to the choice of matching grants, a continuous estimator was unsuitable, hence, the study used a discrete estimator in establishing the general relationship of the firm size to the choice of matching grants. In addition, discrete estimator allowed comparison of wide sets of firm sizes (Karlsson, 2020).The study utilized the European Commission classification of Small and Medium-size Enterprises classification of businesses (European Commision, 2015; European Commission, 2012) where Micro comprised businesses with <20 staff count while small <50, medium <100 and large >100 staff head counts.

According to Abbasi and Malik (2015) firm size has a positive effect to the financial capability of a businesses. It influences debt proportion in the firm's capital. Large firm's stability, diversification in real assets and liquidity influences the ease of getting both internal and external long-term financing (Kira & He, 2012). Large firms normally diversify their products and thus

minimise the risk of failure. The larger the firm, the higher the attraction to the commercial lenders to issue them with credits. Banks and commercial lender are attracted to the large firms due to their ability to take huge amount of credits and partly because they are more diversified hence cushioning any possible risks (Eriotis *et al*., 2007)

Large firm have the capability to negotiate with the lending institutions for favourable credit rates and terms for the long-term debts hence reduce transaction cost. This therefore encourages larger firms to utilize debt financing as compared to smaller firms (Bennett & Donnelly, 1993; Marsh, 1982). Firm size has been found to have a positive relation to a firm's leverage (Eriotis *et al.,* 2007). Fazzari *et al*. (1996) explored the relationship between firm size and financing options and found out that, in hash economic times small firms are normally denied credit in favour large firms that have defined and varied credit repayment options. In addition, economies of scale favour large firms by producing large quantities at lower cost hence maximising on the firm value. Moreover, the large firms are capable of utilizing innovation technologies to improve on output quality. Large firms are also capable of accessing low-cost business capital from either the government or financing institutions (Eniola, 2017). A study conducted by Fatoki and Asah (2011) observed that large firms are highly favoured in accessing debt finance from commercial institutions than small firms.

Whereas larger firms have varied sources of financing their businesses, smaller firms heavily rely on intermediary finances such as microfinance institutions, commercial banks, personal loans and friends and relatives. Thus outcomes of the smaller firms is lower compared to the ones in the large firms (Eniola, 2017). Smaller firms have a challenge in dealing with issues likened to information asymmetry amongst lenders. Hadjimanolis (2000) orated that small firms due to their limited resources, lack the bargaining power to the lending institutions, thus deterring them the capacity to adopt innovated technologies that reduce on cost. Smaller firms are economically disadvantaged in terms of technology adoption, finance acquisition, man-power and the technical know-how. The ability to manoeuvre out of the four majorly depends on the size of the firm (Eniola, 2017; Gërguri-Rashiti *et al*., 2017; Storey, 2011).

Kira and He (2012) reported that there is a positive relationship between firm size and access to debt financing. This was supported by Mahfoudh (2013) who discovered a positive relationship between the firm age and the business financial performance. Firm size has a positive relation to risk and bankruptcy cost (Benkraiem & Gurau, 2013; Hall *et al*., 2000). Empirical studies found a

positive relationship between size and long-term debt financing, and a negative relationship between size and short-term debt financing. In order to ensure that a firm is sustainable, a strong correlation is necessary between firm size and an external financing sources (Mac an Bhaird, 2010; Mac an Bhaird & Lucey, 2011).

In contrast, Fiegenbaum and Karnani (1991) established that age was not significant on the financial performance of the firm. Hadjimanolis (2000) also found out that there was no relationship between size of the firm and financial resources.

2.7.3. Firm location

Entrepreneurs are so passionate about the location of an enterprise. The enterprise location should consider the ease of accessing its clients and lenders. Location of a business shapes and influences entrepreneurial decisions making (Eniola, 2017). Firms that are closer to the lenders have an advantage over those that are far in utilizing quality information related to credit. The lenders too would prefer to lend to firms that are closer for ease of accessing the credibility of the firm that requires debt financing. Monitoring and follow up of such firms is equally easy.

Sustainability and outcome of the firm is determined by the location (Sridhar & Wan, 2007). Studies have shown that credit worthiness of a firm is determined by whether a firm's location is significant (Berger & Udell, 2002; Storey, 2011). Firms located away from the lenders especially those located in the rural areas are disadvantaged in creating a personalised relationship with the lenders and in accessing information related to external funding opportunities Keeble (1997) and Storey (2011) and Rand (2007) stated that firms located in rural areas have a higher affinity of attracting and accessing credit than those located in the rural areas. In contrast (Fatoki & Asah, 2011) affirmed that enterprises in urban areas are more privileged in accessing to debt financing unlike those located in rural areas (Eniola, 2017).

Kira and He (2012) confirmed that there was a positive relationship between firm's location and access to debt financing by SMEs. For this study country where the firms are located was used as a proxy for location and analysis done to establish whether the country where the firms are located had an effect on the choice of matching grant.

2.7.4. Firm ownership

Ownership structure is an outcome of a combination of firm size, control potential, regulation, and amenity potential (Demsetz & Lehn, 1985). Tam and Tan (2007) and Welch (2003) stated

that Limited Liability Companies are mostly preferred form of ownership by lenders followed corporation (Dong & Men, 2014). Empirical study conducted by Welch (2003) and (Tam *et al*., 2007) noted that ownership structure do not have any systematic impact on firm value as long as managers optimize shareholder's interest. However, financiers consider company incorporation as a positive indicator for firm's trustworthiness and commitment to operational laws. The form of business organization has an effect on equity–debt decisions on SMEs operations (Kira & He, 2012). The limited firms are not cushioned against the losses of the business. Therefore, equity financing is more preferred by limited liability firms over debt financing while the unlimited firms only opt for debt financing. Mabula (2019), Reuben Kira and He (2012) and, Fatoki and Asah, (2011) found out a positive association between debt financing and legal formation of business organization thus concluded that there exist a positive relationship between incorporation and access of debt financing for SMEs.

Numerous forms of interventions suggests a positive association between ownership structure and debt financing choice (Bajaj *et al.,* 1998). Firm managers have a duty to ensure that the firm operates at a lower leverage and lessens bankruptcy risks as much as possible. Managers of unlimited firms such as sole proprietor, partnership and groups or society are forced to consider higher debt-equity ratios as compared to the limited firms (Mehran, 1992). Contrary to this Bajaj *et a*l. (1998) argues that equity ownership and leverage are means of safeguarding shareholders' interests and ensures managers to make value maximizing decisions that do not expose the firm to bankruptcy.

Firm managers perform an agency role of undertaking the interest of the shareholders who have delegated their responsibility to them. The authority to run the firm is based on trust that the mangers will run the firm to the interest of the owners of value maximization (Eriotis *et al*., 2007). However, this is sometime not the case and the managers concentrate only on achieving their own targets instead of maximizing the firm value that is the main target for the owners. Some managers have become self-focused to an extend that they have set parallel objectives to those of the owners such as pursuing higher salaries, job security, better working environment and even getting involved in the fraudulent activities that exposes the firm to bankruptcy. Managers interests in many instances have clashed with those of the owners thus emanating a conflict of interest among shareholders and the managers (Eriotis *et al.,* 2007).

To discourage such conflict of interest the owners must set policies and guidelines that discourages such vices from work. This can be done by setting and enforcing operation standards concerned with accountability by use of independent auditors, close supervision, monitoring and control (Eriotis *et al.*, 2007)

In this study, firm ownership was categorized into 4: sole proprietor, partnership, Limited Liability Company and group or society

2.7.5. Organizational structure

In this study the firm structure was categorized into 3: mechanistic/tall, organistic/ flat and matrix structure. Mechanistic generally characterised with clear guidelines and policies. Power and decision making are centred at the top. Government institutions, research organizations fall in this category. In addition, functions are grouped into functional departments. Organistic structures are characterised with a lean organogram aiming to maximize the firm value. Decision making is centred across functional sections as projects and task forces. Private sector and NGO's falls under this category.

Matrix structure is a combination of the functional and project. It enhances interpersonal specialization. Hall *et al.* (2000) advocated that even though particular firm features are sensitive to structural features of a firm, still financial strategy variables pose a very important influence over specific effects on the firm's operations. Consequently, there is hypothetical existence of a positive impact between the firm's structure and access to debt financing by SMEs (Hall *et al*., 2000; Kira & He, 2012).

2.8. Institutional factors and matching grant type

From New Institutional Economics (NIE), institutions are defined as 'rules of the game', encompassing elements such as transactions costs and risks, information flows and property rights. Institutions can enable or hinder market access and development (Dorward, 2001; Dorward *et al*., 2002; North, 1990). Institutions are formulated to govern relationships between individuals or groups of people involved in transactional activities (North, 1990). According to Jari and Fraser (2011), Rodrik *et al*. (2002) and Rodrik (1998), institutions can be viewed in terms of their 'market- creating' or 'market-inhibiting' attributes, to the extent that such issues as property rights and rule of law influence decision making of an individual, groups or even an economic society. Institutions play an important role in promoting or hindering economic activities.

Institutions are divided into formal and informal. Formal institutions refer to generally agreed and documented rules, guideline, policies whereas informal institutions refer to agreed but undocumented norms, rules, practices that are enforced by an organization. Institutions influence the direction of decision making in an organization (Kherallah & Kirsten, 2002).

In the context of this study, matching grant is a formal institution required by the donor for accessing agribusiness innovation grant. The study sort to find out the formal and informal institutional factors that determine the amount and type of matching grants provided by agribusiness firms, the current enforcement mechanisms to these institutions and the factors to be considered in determining the level of matching grant as recommended by the beneficiaries. This would be important in redesigning a suitable matching grant for agribusiness firms.

2.9. Empirical literature on matching grants model

Even though matching grants schemes have proved to be the most popular for private sector intervention, there is no single or a combination of matching grants models so far recommended for implementation by any project. Phillips (2001) emphasised the need for matching grants to be customised or tailored to the local prevailing conditions of the beneficiary and the funders' target to the market failures. The IFAD Matching Grants' Technical Note. (2012) only provided the general guidelines to be considered in developing an appropriate matching grants scheme. In 2017, World Bank Group in their report of matching grants schemes for productive alliance in Caribbean and Latin America indicated that, even though in the design of almost all projects required the linkage of the beneficiary to commercial financial services, this was just on paper (Horst & del Mar Polo, 2016). In addition, the recommendations made found little room in the project implementation platform.

Apart from the matching grants guidelines by IFAD that provided the general guidelines for matching grants levels and the need to assess the willingness and capacity for the beneficiary, the other studies, reviews and reports only focused on matching grants schemes or project in totality. It is important to note that matching grants project compose of the beneficiaries' contribution and the funders' contribution. The literature in place focused on the combination of the two. This study therefore, seeks to bridge the literature gap by: clearly highlighting the specific components of the matching grants (beneficiary contribution), identify and analyse constraint that agribusiness firm face in providing these matching grants, identify the most preferred matching grants component

by agribusiness firms and the effects of firm characteristics and institutional factors on the choice of matching grants.

More so, the agribusiness sector is portraying a unique feature of attracting proportionately a larger volume of funds to facilitate its capital assets unlike non-agricultural sector. Considering the inherent challenges encountered in financing agribusinesses innovation, matching grants projects attracts the attention of the industry to develop an effective matching grants model.

2.10. Theoretical framework

The study was hinged on open innovation theory and Public Private Partnership (PPP) Framework.

2.10.1. Open innovation theory

Chesbrough (2003) defines Open Innovation as the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. It combines internal and external ideas into architectures and systems (H. W. Chesbrough, 2003) Organization structure can be a tool for accelerating innovation by integrating external technologies and knowledge to improve their own knowledge and monetize internally developed innovations that are not immediately utilized to other markets. The study is anchored on open innovation framework since matching grants is about complementing the internal resources with the external resources.

Chesbrough (2003) noticed that most companies were doing well in their current markets but had difficulties exploring other market opportunities outside their scope. There was an expansive diffusion of domain knowledge of applied research especially from R & D institutions to other markets outside. Therefore, there is an opportunity in the open world demonstrated by use of a funnel with porous boundaries. The theory is founded on two core concepts: utilization of external knowledge and technology to strengthen the internal innovations and creating value from internally developed innovations for an external market (H. W. Chesbrough, 2003). This will decrease 'false negatives' associated with innovation that term some technologies to be unfit and unpromising internally, yet they are of high value externally.

Internal innovation can be utilised in 3 ways: internally incorporate the technology in the business model, sell out or license ideas that are viewed as insignificant externally and launch a new venture to utilize the technology internally (H. Chesbrough, 2006). Sisodiya *et al.* (2013)

defined open innovation as a firm's purposive pursuit and integration of external inputs for new product development, that offers an alternative perspective on innovation. Chesbrough used an open funnel with holes to visualise the interaction of the internal and external technologies along the way. The porous boundary of organisations promotes free movement of knowledge in and out of the funnel with little restriction.

Open innovation gives much emphasis on the inflow and outflow of knowledge asset in an organization. However, little insights are given to the financial assets which arises through internal and external interaction of innovation. This study intends to broaden the scope of 'resource' of open innovation framework by including the internal and external 'funding' as an ingredient in technological acquisition. In addition, firms' process of acquiring knowledge involves financing. Therefore, besides firms providing cash, machinery, staff time and space, organizations can opt to provide knowledge as matching grants to a project. Matching support by firms is a critical element of defining the internal resources available for agribusiness innovation.

2.10.2. The public private partnership (PPP) framework

Asian Development Bank (2006) in the PPP Handbook defined PPP as a mechanism for improving the delivery of public goods and services by partnering with the private sector while retaining an active role for the government to ensure that national socio-economic objectives can be achieved. The PPP framework adopts a broader collaboration by encompassing formal and informal partners such as public, private sector, NGOs, civil societies and international donors (World Economic Forum, 2006). For PPP to succeed, there is a need for the public sector to set pace by rolling out the mission and providing a conducive environment necessary for the formation and implementation of its mandate beyond the project period.

The formation of PPP in agriculture is justified by the market and policy failures that provide the public goods such as food security, food safety, protection of the environment and economic empowerment (Hodge & Greve, 2007). In a well-defined PPP framework, the public achieves economic and social benefits that it would have otherwise been unable to achieve alone due to the financial and institutional constraints. The recent appeal for policymakers and practitioners to form PPPs in agribusiness include: to unleash the Potential financial leverage to the public that is constrained by the budgetary allocation over the decades (The World Bank, 2007); share risks of

entrepreneurship; tap the power of innovation, efficiency and market access; and to address global challenge such as food security and inclusion.

The incorporation of PPPs for R&D and Innovation is common worldwide. PPPs provide an essential framework that steer the coordination of finances, R&D and governance in innovation systems by stakeholders to facilitate demand driven innovation (Rankin *et al.*, 2016). This may result in additional income from joint property licencing and royalties that can spin over to other markets providing a competitive edge over their competitors. For the private sector, PPP provides an opportunity for protecting intellectual property, minimises the risk associated with the new innovations and tapping into extensive public sector network to promote product distribution and adoption (FAO, 2016).

The current PPP frameworks are designed to address national, regional and global challenges. High level partnership address objectives such as food security, market access, labour productivity, traditional R &D, small scale value addition and technology transfer (FAO, 2019). The most recent is the public-private-producer partnership (4P) national research programmes that promotes innovation in agro-industry development. The 4P emerged, to acknowledge and address the coordination and co-financing role played by producers in agribusiness value chain and innovation PPP framework (Syngenta, 2014).

The PPP framework is largely about collaboration and supports Open Innovation theory. It is the platform that governs the operation of private and public sectors collaboration enshrined by combining their resources together in the form of knowledge, skills and finances for a common goal (Brant & Lohse, 2014). PPP framework brings the sharing of the financial element into agribusiness innovation. The idea that each party contributes for innovation activity fits well with the requirements of matching grants model.

2.11. Conceptual framework

Figure 1 provides a framework which links firm characteristics, institutional factors, matching grant choice and matching grant model to enhanced administration of matching grant. The study perceived a relationship between firm characteristics, institutional factor and matching grant choice.

The study sort to explore the possible linkage and association of Firm characteristics to the choice of matching grant. The firm characteristic was categorised into 5: organizational structure,

ownership structure, location, size and age. The study sort to find out whether different firm characteristics had an influence on the choice matching grant. Organizational structures were grouped into 3: Mechanistic, Organistic and Matrix structure, Size was categorised into micro, small, medium and large firms. Size was categorised as young, medium, old and older. Countries were used a proxy for location. Ownership structure was categorised into 5: Limited Liability Companies, Cooperation, Partnership, Sole proprietor and groups and societies

Besides firm characteristics, there are mediating factors that influence the choice of matching grant. The study concentrated on formal and informal factor of an organisation otherwise referred to as the "rule of the game". The study looks at the practices, regulations, standards, rules and policies that governs the choice of a matching grant type.

Agribusiness firms that are beneficiary of BA grants are normally required to provide 25% matching grant in 3 ways: cash or cash equivalent, in-kind or a combination of cash and in-kind matching grant. In-kind matching grant includes; payment of overhead costs, staff salaries, production facility rent, land rate, licencing etc. Thus, it was important to find out what influences the choice of matching grant.

The study aimed at identifying firm characteristics and institutional factors that influences the choice matching grant. Identification of these factors will lead to development of a matching grant model that will enhanced administration and operationalization of matching grant by the grantor and grantee. Thus, resulting to increased financing and stimulation of agribusiness innovative technologies.

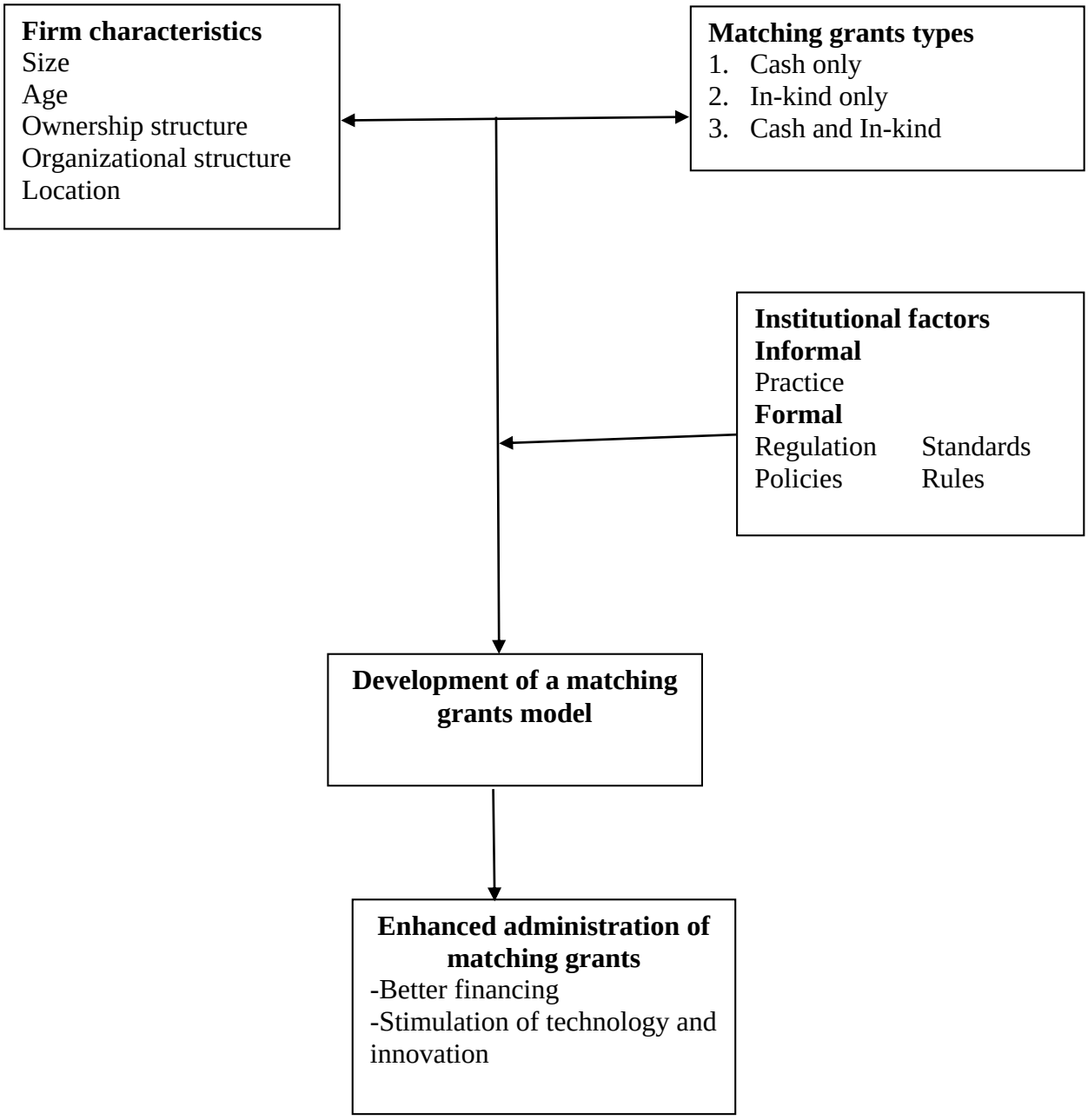


Figure 1: Conceptual framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. The study area

The study was conducted in 38 agribusiness firms which are beneficiaries of BioInnovate Africa phase II grants within Eastern Africa countries: Kenya, Uganda, Burundi, Rwanda, Tanzania and Ethiopia. The name and location of each firm is as shown in Appendix 1 and Figure 2 respectively.

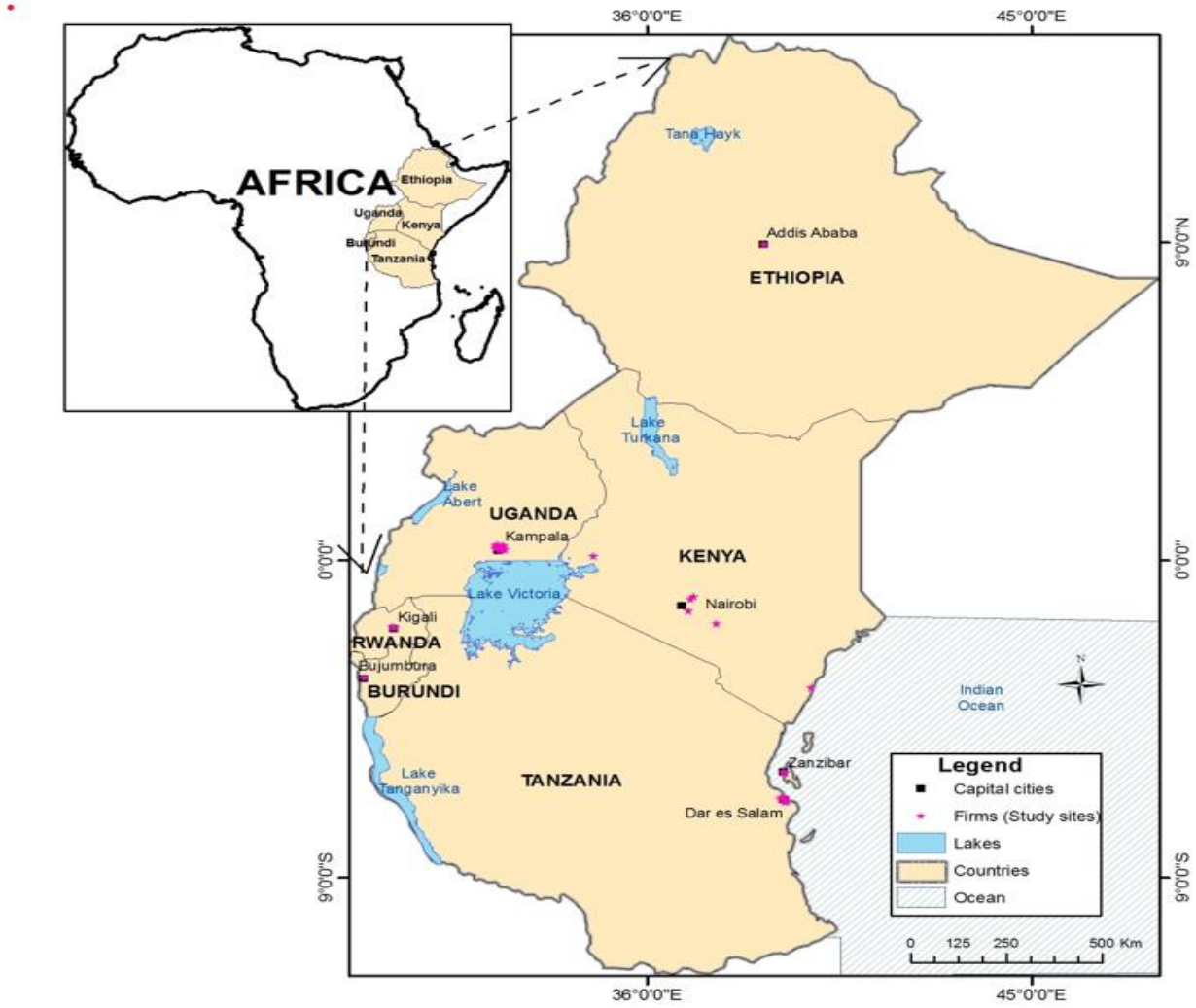


Figure 2: Map of Eastern Africa and study area

3.2. Research design

The study used a descriptive research design to identify and describe matching grants characteristics, trends, correlations, categories and behaviours. A case study of BioInnovate Africa was used to explore on constraints agribusinesses face in provision of matching grants; and explain the effects of firm characteristics and institutional factors on the matching grants type. The research design was chosen due to its ability to integrate different qualitative and quantitative data collection methods. In addition, the design addressed qualitative data related to opinion, preference, and beliefs of people with accuracy and precision in the research topic.

3.3. Target population

The respondents were project leaders or co-project leaders of the agribusiness firms that were beneficiaries of BioInnovate Africa Phase II grants in Eastern Africa (Kenya, Uganda, Tanzania, Burundi, Rwanda, and Ethiopia) as shown in Table 1. A complete enumeration (census) was used where every unit of the population was selected enhancing accuracy and unbiased results. Key informant interviews were carried out only in Kenya.

Table 1: Distribution of agribusiness firms per country

Country	Kenya	Uganda	Tanzania	Burundi	Rwanda	Ethiopia	Total
No. of firms	14	12	8	1	2	1	38

Source: BioInnovate Africa (2017).

3.4. Data collection tools and procedures

The study employed a mixed-approach method where questionnaires and key informant interviews were used to collect quantitative and qualitative data respectively.

3.4.1. Questionnaires

The survey was conducted using an online survey monkey tool targeting BioInnovate Africa Programme implementing partners/firms in 6 countries: Kenya, Uganda, Tanzania, Rwanda, Ethiopia and Burundi. Semi-structured pre-designed questionnaire was used to capture quantitative data (see appendix 4). Close-ended multiple-choice questions was used to capture the opinions, perception and attitude of the respondents. The questionnaire was pretested before administration within the firms in Nairobi and BioInnovate Africa Project Management Office

(PMO) at ICIPE, Duduville campus. The questionnaires were administered to the entire population where, probability of a firm to be sampled was equal to one ($P = 1$). Surveymonkey tool was used to develop, dispatch, monitored and collect data. A total of 30 firms out of 38 responded to the survey representing 78% response rate. Project Leaders were purposively selected for the survey. Project Leaders' contacts details were provided by the PMO. This assisted in follow up, cleaning and validation of data.

3.4.2. Key informant interviews

Key informant interviews involved a set of assumptions and understanding from the literature review and survey about matching grants (Denscombe, 2014). A qualitative in-depth interview with Project Leaders bearing unique knowledge of the study was done. The Project Leaders were purposely selected since they met the 5 ideal characteristics of key informants described by Cossham and Johanson (2019) as follows: they played a key role and had a vast knowledge on project implementation; willingness to cooperate and share information; communicability; intelligible on the subject; impartiality and; minimal personal biasness (Cossham & Johanson, 2019; Marshall, 1996). Agribusiness firms in Kenya were purposively selected due to proximity and since they composed the largest category among six countries. A total of 12 out of 14 firms in Kenya were interviewed. The contemporary views of key informants were necessary in identifying the constraints and the institutional factors that informed the choice of matching grants. A set of predetermined questions (see appendix 3) and a highly standardised technique of recording was used to collect qualitative data. The interviews were recorded and transcribed while memos and notes were based on observations. The records were partially transcribed to their respective anchor codes since thematic analysis did not necessitate full transcription.

3.5. Data analysis

Data from Key informant was analysed using qualitative content analysis while from the survey was analysed using Stata 16.0.

3.5.1. Characterization of matching grants

To characterise matching constituents, the study used key informant interview and questionnaires in identifying the different type of matching grants provided by agribusinesses. The matching grants categories were identified and a documentation of a costing matrix developed.

The current BioInnovate Africa matching grant ratio was then ranked. Agribusinesses' preference of matching grants was also determined by plotting the result in a pareto chart. The 80/20 pareto optimization rule determined the areas where the donors should endeavour to optimize their efforts as far as matching grants is concerned.

3.5.2. Matching grants constraints

To analyse constraints experienced by agribusinesses, the study identified different constraints faced by agribusinesses in provision of matching grants. This was done in both survey and key informant interview. The constrains from key informant interviews were then analysed using qualitative content analysis and possible mitigation measures to cab the constraints identified.

3.5.3. Firm characteristics and matching grant choice

The study utilized Generalised Structural Equation Modelling (GSEM) multiple multinomial logistic (MML) models to analyse objective 3. GSEM was chosen due to its robustness against violation of normality in small data size when combined with Maximum Likelihood Estimation (MLE). In addition, GSEM has a higher power to identify relationships significant to the population. GSEM is a multivariate procedure for examining a set of generalised relationships between one or more discrete independent variables and/or dependent variables whether discrete or continuous predictors of outcomes (Tabachnik & Fidell, 2013).

It utilised multivariate techniques such as multiple regression analysis and factor analysis to estimate the inter-correlation dependent relationships simultaneously (Hair *et al.,* 2012). The factor analysis was able to provide the measurement model while the regression part of the GSEM was able to provide the Structural model. GSEM was able to give a direct link between the path diagram, equation and indices of fit statistics hence provided the model that best fit the data. GSEM was chosen because the study interest was on direct and indirect effects of both the measurement construct and the structural constructs. Data screening was done to eliminate outliers and nonlinearity.

The technique allowed a comprehensive means of assessing and modifying the hypothetical models than the factor analysis and multiple regression analysis combined (Gerbing & Anderson, 1988). GSEM was used to determine whether the covariance matrix was consistent with the initial hypothetical model (Tabachnik & Fidell, 2013).

Hypothetical models in figure 3 pictorially illustrate the flow and interaction both the dependent and independent variables. This enabled a clear comprehension of the structural model of matching grants.

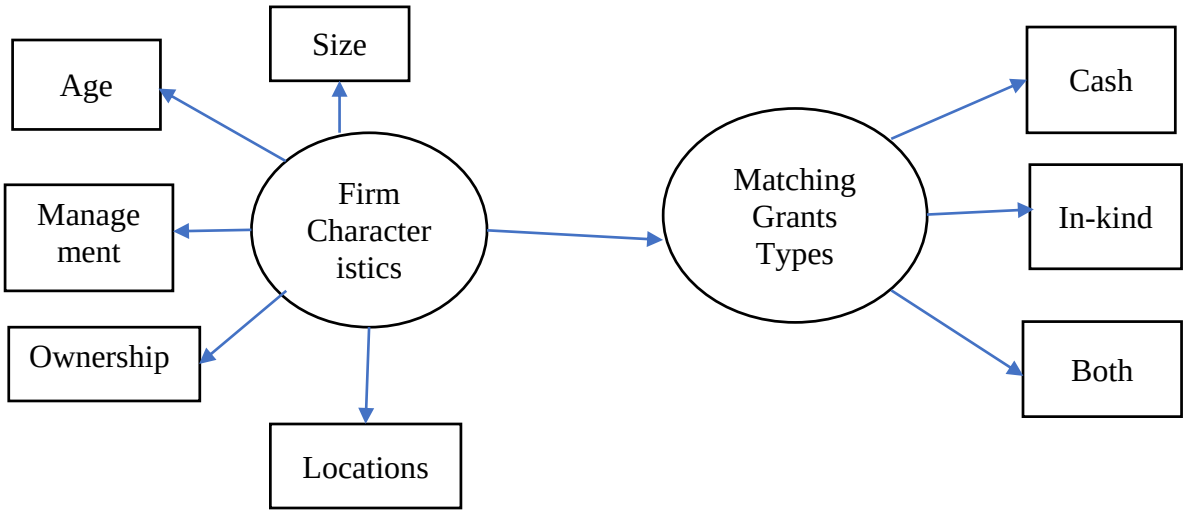


Figure 3: Hypothetical model for firm characteristics and matching grants choice

The Firm characteristics construct can be represented using a structural equation as follows:

$$x_1 = \alpha_1 + \beta_1 X + e{:}x_1$$
$$x_2 = \alpha_2 + \beta_2 X + e{:}x_2$$
$$x_3 = \alpha_3 + \beta_3 X + e{:}x_3$$
$$x_n = \alpha_n + \beta_n X + e{:}x_n \quad (1)$$

The matching grant construct can be represented using a structural equation as follows:

$$y_1 = \alpha_1 + \beta_1 Y + e{:}z_1$$
$$y_2 = \alpha_2 + \beta_2 Y + e{:}z_2$$
$$y_3 = \alpha_3 + \beta_3 Y + e{:}z_3 \quad (2)$$

Where:

$x_1 \ldots x_n -$ Observed or measurement exogenous variables of the firm characteristics and n is 5, $y_1 \ldots y_n$ – Observed or measurement endogenous variables of the matching grants type and n is 3, X- Latent exogenous variable (Firm Characteristics), Y- Latent endogenous variable (Matching Grants Type). Error variables were denoted with prefix $e{:}z -$for the associated observed endogenous variable and $e{:}x - and\ e{:}y -$ for the associated observed exogenous variable.

The 2 set of structural equations (1 & 2) can be expressed in STATA as follows:

$$gsem\ (X \rightarrow x1)(X \rightarrow x2)(X \rightarrow x3)(X \rightarrow x4)(X \rightarrow x5)(Y \rightarrow y1)(Y \rightarrow y2)(Y \rightarrow y3) \quad (3)$$

Equation (3) can also be represented as follows:

$$gsem(X -> \ x1, x2, x3, x4, x5)(Y -> \ y1, y2, y3) \quad (4)$$

Equation (4) can be expressed to include the error term as follows:

$$gsem\ (X, x1, x2, x3, x4, x5, e.x1, e.x2, e.x3, e.x4, e.x5)(Y, y1, y2, y3, e.y1, e.y2, e.y3) \quad (5)$$

GSEM utilised multiple multinomial family and logistic link due to the fact that the dependent variable was a discrete variable with no natural ordering or ranking. Model estimation utilised Maximum Likelihood (ML) to estimate the maximum probability that the observed covariance is drawn from a population assumed to be the same as the coefficient estimates. ML assesses the extent to which the model was consistent with the data. ML assumes multivariate normality by controlling heteroscedasticity and was appropriate for a small data size thus remain robust (Rigdon & Hoyle, 1997).

Agribusinesses had 3 possible outcomes to choose from: cash only, in-kind only or a combination of cash and in-kind. The order was treated simultaneously by extending binary logistic model for each pair of response category to make inferences of all comparison among alternatives. The most frequent outcome was designated as the base or reference category. The probability of choosing one outcome category over the probability of choosing reference category also known as relative risk ratio (rrr) or Odds was done by exponentiation of β in the linear equation 1 and 2. This yielded a regression coefficient that are relative risk ratio for a unit change in the predictor variable.

Where:

the covariance has 3 categories coded as $(0, 1\ and\ 2)$ and $K - 1$ possible pairwise log odds.

The log odd for comparison between 0,1 was as follows:

$$ln\ \frac{P(D=1\ /X_1)}{P(D=0/X_1)} = \alpha_1\ + \beta_{11}X_1 \quad (6)$$

The log odd for comparison between 0, 2 will be as follows:

$$ln\ \frac{P(D=2\ /X_1)}{P(D=0/X_1)} = \alpha_2\ + \beta_{21}X_1 \quad (7)$$

Where:

$y\ =\ 0$ is the reference outcome, P is the probability and D is the outcome. RRR also known as the odd ratio was determined as follows:

$$OR_1\ (X = 1, X = 0) = \frac{\Pr(D=1\ /\ X=1)/\Pr(D=0\ /X=1)}{\Pr(D=1/\ X=0)/\Pr(D=0\ /X=0)} = exp^{B_{11}} \quad (8)$$

$$OR_2\ (X = 2, X = 0) = \frac{\Pr(D=2\ /\ X=2)/\Pr(D=0\ /X=2)}{\Pr(D=2/\ X=0)/\Pr(D=0\ /X=0)} = exp^{B_{21}} \quad (9)$$

$$The\ sum\ total\ of\ probability = P(D = 0/X) + P(D = 1/X\ ) + P(D = 2/X) = 1 \quad (10)$$

Let say:

$$\lambda_1\ (X) = \ \alpha_1\ + \sum_{i=1}^{k} \beta_{1i} X_i \quad (11)$$

$$\lambda_2\ (X) = \ \alpha_2\ + \sum_{i=1}^{k} \beta_{2i} X_i \quad (12)$$

then,

$$P(D = 0/X) = \frac{1}{1+\exp[\lambda_1\ (X)]+\exp[\lambda_2\ (X)]} \quad (13)$$

$$P(D = 1/X) = \frac{\exp[\lambda_1\ (X)]}{1+\exp[\lambda_1\ (X)]+\exp[\lambda_2\ (X)]} \quad (14)$$

$$P(D = 2/X) = \frac{\exp[\lambda_2\ (X)]}{1+\exp[\lambda_1\ (X)]+\exp[\lambda_2\ (X)]} \quad (15)$$

Interpretation of the significance and the estimated coefficient was based on which response corresponded to the numerator and the denominator. Model estimation utilised Maximum Likelihood (ML) to estimate the maximum probability that the observed covariance is drawn from a population assumed to be the same as the coefficient estimates. ML assesses the extent to which the model is consistent with the data. ML assumes multivariate normality and is appropriate for a small data size though it remains robust (Rigdon & Hoyle, 1997). Under the assumption of the multivariate normal distribution, the overall log likelihood for θ will be:

$$logL(\theta) = \frac{w.}{2}[klog(2x) + log\{\det(\sum_0)\} + tr\ D(\sum_0 - 1) \quad (16)$$

where:

k is the number of observed variables, $\sum_0$ is the submatrix of $\sum$ corresponding to the observed variables, θ will be the vector of unique model parameters and μo is the sub-vector of μ corresponding to the observed variables: Description of variables are as shown in Table 2.

Table 2: Description of variables

No.	Variables	Description	Unit of measurement	Hypothesised sign
A	**Dependent Variables**			
1	Matching Grants Choice	The choice that a firm makes as a result of firm characteristics	Cash or in-kind or Both	+/-
a.	Cash	Cheque or cash provided as matching grants	(1=Yes, 0 =No)	+/-
b.	In-kind	Non-cash matching grants	(1=Yes, 0 =No)	+/-
c.	Both	Cash and in-kind matching grants	(1=Yes, 0 =No)	+/-
B	**Independent Variables**			
1	Age	The number year a firm has been in operation	1-5yr (1) 6-10yrs (2*) 11-15yrs (3) >15yrs (4)	+/-
2	Size	The number of employees in a firm	1-20 employees (1*) 21-50 employees (2) 51-100 employees (3) >100 employees (4)	+/-
3	Ownership	The power to control and operate a firm vested share owned in the firm	Sole proprietor (1) Partnership (2) Ltd Liability Co (3*) Society/Group (4)	+/-
4	Management	The organizational structure of a firm	Mechanistic (1*) Organistic (2) Matric (3)	+/-
5	Location		Kenya (1*)	+/-

	The country under which a firm operates	Uganda (2) Tanzania (3) Burundi (4) Rwanda (5) Ethiopia (6)

*Base outcome

3.5.4. Institutional factors and matching grant choice

Qualitative content analysis was used to analyse institutional factors that influence the choice of matching grants. Data from key informant interviews was collated and analysed. A total of 12 out of 16 key informants from Kenya were interviewed. A manual coding process was preferred as recommended by Matthes and Kohring (2008) since it is more efficient and effective than automated coding when dealing with a small sample. Anchor codes were assigned to informants' research questions in order to organize data. The recorded interviews and the short notes were transcribed into text in Microsoft Word as per the anchor codes. The text lines were then numbered and the first stage coding done by indexing using the new comment to highlight the relevant statement by first typing the respective anchor codes followed by the other codes.

Multiple coding strategy such as In-vivo, process, evaluation, narration, versus, hypothesis coding and structural coding strategies were used. In total, 11 sub-codes were generated and for constraint and 11 sub-codes for factors to be considered in setting the level for matching grant for agribusinesses. The codes were then extracted using the DocTool and transferred to Microsoft excel where they were analysed by sorting into the respective anchor codes and tallying each code. After which, the codes were categorized, synthesized and examined (Saldaña, 2013). Data condensation was then done in order to organize, make sense and address the research questions.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Characterization of matching grants provided by agribusiness firms

In this section, the research focused on; types of matching grant agribusinesses provide, matching grant categories, mangers ranking of BioInnovate Africa matching grant and matching grant costing framework.

4.1.1. Types of matching grants

Agribusiness firms provided different matching grants as shown in Figure 4.

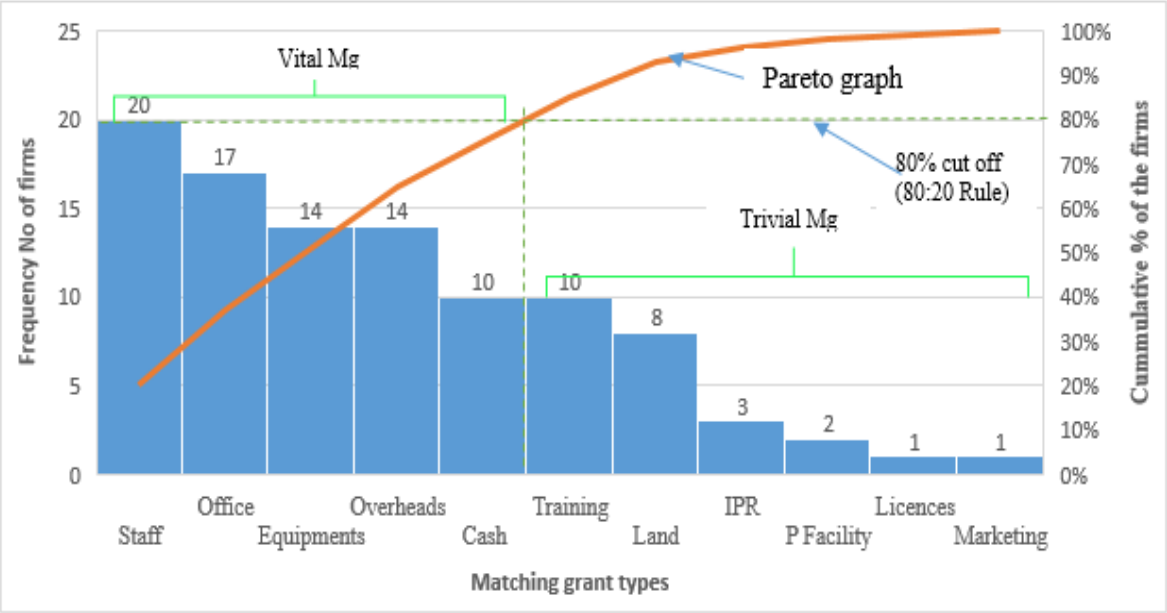


Figure 4: Agribusinesses matching grant types

The Pareto analysis chart in Figure 4 shows the contributions of matching grant of the firms. Pareto chart was based on the 80/20 principle developed by Italian economist, Vilfredo Pareto in 1896. The principle states that, roughly 80% of the events arise from 20% of the causes. Indeed, Juran in 1969 observed that Pareto's principle universally applied to all astounding situations (Ivančić, 2014).

The results indicated that 80% of the firms provided staff, office, machineries, overheads cash and training. The two sections of the graph representing the most preferred (vital) to the least

preferred (trivial) matching grants. The steep section shows the matching grants that are contributing to a high proportion in firms. Agribusinesses mostly preferred in-kind matching grants where 80% of the firms provided staff, 70% office space, 58% overheads and equipment each. Only 40% committed cash and training each. Land, intellectual property right, production facility, licenses and marketing were the least provided matching grants contributing to 34%, 12%,8%, 4% and 4% respectively.

The results suggest the need for grantors to confine matching grants provided to a few portfolios rather than leaving the firms make random choice. From Figure 4, vital matching grants are staff, office space, overheads, equipment, and cash. Perhaps grantors are making obvious mistakes by leaving the matching grant type open thus complicating its costing framework which results to low reporting. A lot of time and money might be saved by focusing only on the matching grants types that are vital and mostly preferred by agribusinesses.

Staff as a resource was the most preferred matching grant. This was because staff are the brand ambassadors of an organization. Staff determines the success of an institution. Staff are also flexible; they can be stretched and reallocated to achieve an intended goal. Staff must be present from idea formulation to goal achievement

The results depicted an optimization function that when employed can generate the greatest impact while employing the most significant resources. In general, Pareto 80/20 rule is simply a principle followed by the Pareto power of the law of distribution. It is based on continuous observations, and it has turned out to be applicable to almost any field in life and to many natural phenomena.

4.1.1. Matching grant categories

Most of the agribusiness firms (56.67%) preferred a combination of in-kind and cash forms as illustrated in Table 3. Cash only was the least preferred with only 6.67%, while 36.67% of the firms provided in-kind only as matching grant.

Table 3: Matching grant category

Matching grant choice	Frequency	Percent(%)	Cumulative
Cash only	2	6.67	6.67

In-kind only	11	36.67	43.34
Cash and In-kind	17	56.67	100.00
Total	30	100.00	

4.1.2. Ranking of BioInnovate Africa matching grant

Agribusiness managers were asked to rank BioInnovate Africa matching grant in a scale of low, moderate and high in terms affordability. The results are as shown in Table 4.

Table 4: Matching grant ranking

Ranking	Frequency	Percent (%)	Cumulative
High	7	23.08	23.08
Moderate	18	65.38	88.46
Low	5	11.54	100.00
Total	30	100.00	

The results indicated that 65% of the total firms scored BioInnovate Africa matching grant as moderate followed by 23% feeling that the rate was high and unattainable to the SMEs and start-ups while 12% were of the opinion that the rate was low compared to other investors with similar innovation projects. This meant that about 77% were comfortable with BioInnovate matching grant requirements.

4.1.3. Matching grant costing framework/ model

One of the outcomes of this study was the development of a matching grant costing model and is presented in Table 5.

Table 5: Matching grant costing framework /model

No.	Matching grant type	Matching grant costing criteria	Source documents
1	Consultancy	Worked out based on company rate for similar works: Cost manpower, resources and facility hire	Company approved rates

2	Machinery	Based on cost of production /period	Approved production cost schedule
3	Intellectual Property Rights (IPR)	Charged per usage for example 2% /unit production	Copy of the IPR Licence and approved application rate
4	Land	Current market rate of the region	Regional market rate schedule
5	Marketing	Salary for marketing and sales person, transport, telephone cost, advertisements	Approved payroll and receipts
6	Office	Apply the current market rates for the cost per square meter	Market rates
7	Overheads	Amounts paid for electricity, water, and rent	Receipts
8	Production facility	Evaluate the facility cost at the beginning of the project. Determine the cost per unit of production and apportion the cost appropriately	Facility evaluation report and approved report
9	Reagents/raw materials	Cost of reagents/ raw materials and transport cost	Receipts
10	Staff	Staff equivalent: Salary, pension, medical cover, and any other allowances entitled to the staff. them apportion the % to the project in case the staff is partially involvement or charge the full staff equivalent if they were brought in by the project	Approved payroll, HR manual extracts and time sheets
11	Training	Cost for training: the facilitator, number of people trained, number of trainings, cost of the conference	Receipts/ contract for the facility, Lists of attendance

		facility and apportion the cost appropriately	
12	Licensing/Permits	Cost of acquiring government/ regional licenses and permit	Receipts and copy of permits/ licenses

4.2. Constraints experienced by agribusiness while providing of matching grants

In this section, findings on constraints from both the survey and key informant interviews are reported.

4.2.1. Constraints faced by agribusinesses in providing matching grants

Constraints faced by agribusinesses in providing matching grants are shown in Figure 5.

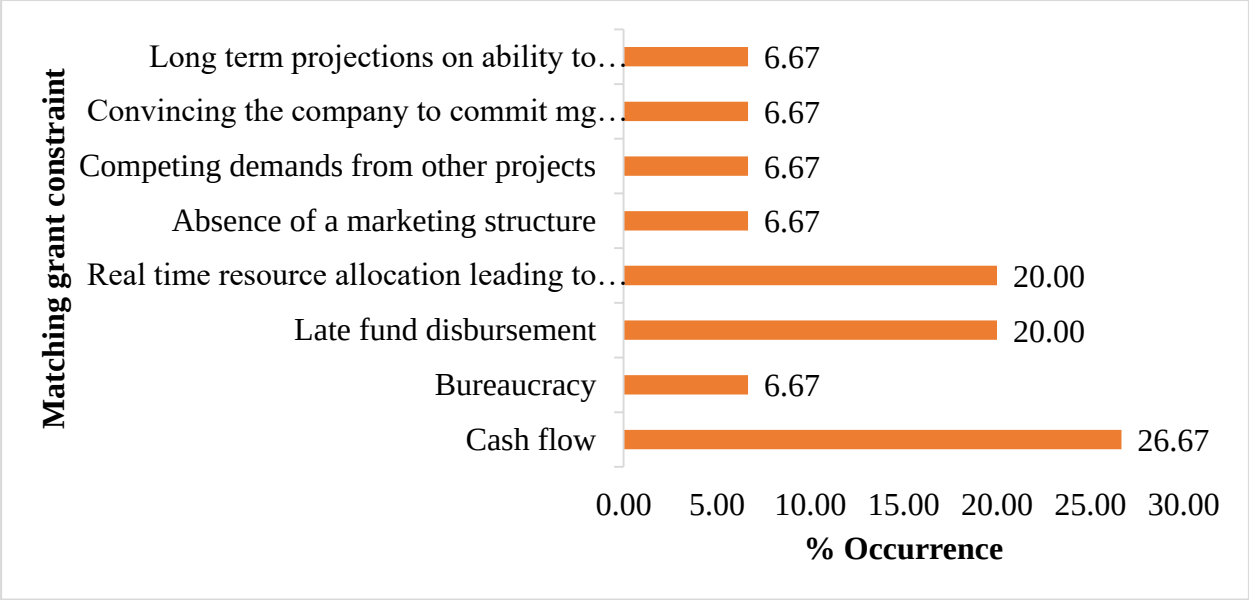


Figure 5: Summary of constraints experienced by agribusinesses

The main constraint faced by agribusinesses in providing matching grants, was cash flow, representing 26.67% of the total firms. This agrees with Phillips (2001) recommendations of redesigning matching grants schemes to include the linkage of the beneficiaries to the commercial financial institutions to ensure long term sustainability of the projects. Real time resource allocation and late funds disbursement were the second constraints contributing to 20% each. Other constraints listed were difficulty in projecting the long-term ability to provide matching grants (6.67%) and convincing management to commit a resource as matching grant when they may not

see an impact on the firm's performance (6.67%). Competing demand from other projects (6.67%) and the absence of a marketing strategy of the innovated products (6.67%) was also cited as a constraint. Finally, there was bureaucracy (6.67) that involved too much paper work in reporting matching grants.

4.2.2. Constraints reported by key informants

While providing matching grants, firms encountered varied types of constraints depending on their experience, project type and professional background as discussed. It was necessary to obtain verbatim extracts of the key informant interviews concerning the constraints experienced while providing matching grants.

1. Bureaucracy and duplication of documents

"*There is just so much of documentations and paper work that is crazy that takes a lot of time and energy that pulls you away and can easily demotivate you from the main activity. In documenting there is a lot of duplication. Being the owner, I do not sign anywhere, yet I am expected to provide a time sheet as a proof for offering my time as matching grant … the project needs to let the result speak for itself".*

Informants reported bureaucracy and duplication of documents required during the project implementation which was energy and time consuming. The informants complained of the long procurement procedure when dealing with contracted works. The programme too required a standardized reporting format for matching grants that the managers felt to be cumbersome and amounted to delay in output delivery.

2. Difficulty to quantify

"*It is very difficult to quantify matching grants. There are a lot of variables, to determine how much you have put in. we can only talk of the cost of doing that. But for the purposes of determining the cost, you can put all that scope and say training was meant for 10 agro-processing firms... the total grant was Ksh. 2.5 million … we were meant to provide Ksh. 600k as matching grant, you will realise we do much".*

The respondents felt that the contract document is not clear when it comes to matching grants to be provided. As a matter of facts, when committing to the project, the beneficiary looks at the overall benefits of the project. At the same time, the project funds are released based on the

progress reports to justify funds utilization, and development that have taken place. They are not based on the matching grants provided. Thus, informants felt that this might have been the cause of laxity in reporting matching grants. This was in agreement with the Independence Evaluation Group & World Bank Group (2014) in their comprehensive review that concluded that, even though matching grants were becoming popular as one of the best tools in committing SMEs, it was challenged by implementation difficulties. Firms do not know how to implement the matching grant policy.

3. Resource allocation

"Sacrificing time for technicians to do it. We work with targets so everyone has target for every day, week and year. Allocating the staff for both BioInnovate and our firm sometimes interferes with production".

Firm's choice of matching grants is based on available resources within the firm. Most BioInnovate Africa Programme beneficiaries are not starter firms but have been in existence for more than 2 years. This, therefore, meant that before the project set in, the resources were committed to various production programmes. Once the project came in, then firms were required to reallocate or procure resources to the project as matching grant. This can be challenging especially when the resources offered as matching grant have a competing demand from either the firm or other projects. In addition, firms have defined roadmaps and operational budgets. In an event that the matching grant is done off the plan and budget, then, they are likely to encounter challenges of funds appropriation.

4. No control and delayed funding

"*For BioInnovate Africa Programme the funding doesn't come when we need it, they have their own internal systems. We are forced to fit in their program. When grants delay, we are forced to carry some of the activities on our own through our own reserves. That's why I say it is unfair for us because you have no control over certain things*".

BAP has clear protocol on funds disbursement. Generally, the funds would delay based on some administrative or assessment of a project's progress. The informants reported that when funds delay, they are forced to use their own reserves to carry out the project activities. This at the end strains a firm's resources. In a situation where there are no reserves, then they are forced to wait until they receive the funds from BioInnovate.

5. Matching grant do not favour start-ups firms

"The other is the people who are start-up. It is hard to provide matching grant. So, they need a pro rata. Otherwise, it doesn't work. For start-ups, the donor need to consider whether they have the capacity to deliver and the technical know-how? Matching grants only favours the firms who already can".

Start-up firm are l in less endowed in resources compared to already established firms. Emerging firms especially those that are run by women and youths find it difficult to match the grant. Thus, a suggestion that start-up should not be subjected to providing the matching grant instead, the donor should consider their technical know-how and capacity to deliver as a matching fund.

6. Partnering with government institutions.

"We do not have direct access to the equipment hub for training except through other institutions. We face challenges because the custodian of these hub may not be there for you. They should have the prototype but avail it to the private sector".

BioInnovate Africa in encouraging multi-sectorial and inter-disciplinary collaboration, designed their projects to be undertaken by different partners in six countries within Eastern Africa**.** Co-partners were sourced from universities, government, international organizations, Community Based Organization (CBOs) and private institutions. All these organizations have varied working protocols that may not be compatible to one another. Some informants felt that when the output is dependent on a public organization's matching grant such as a training hub for famers, then access to it should be guaranteed wherever need arises.

7. **Unforeseen innovation roadblocks**

"*Occasionally, projects don't run the way they should run especially because we get involved with inventory projects a lot. We do not know the roadblocks that we are likely to encounter in innovation".*

Informants commit firm resources as matching grants to the project with anticipation that the project will benefit the firm. Most innovation projects have encountered a lot of setbacks, for instance the product uptake may be too slow for a firm to recoup its money as envisaged. Furthermore, the technology may fail to meet the expected output or be too expensive. Therefore,

if firm's resources were committed to such technologies, then there are likely to lose. Likewise, in an event that the technology fails, the donor or investor has also failed to meet the intended goal.

8. **Matching grant is dependent on the firms' financial stability**

"*Yes, if the company is not stable in such cases, matching will be a challenge too."*

Matching grants are fully dependent of the firm's capacity to meet its financial obligations. Firms that are struggling to meet their financial mandate may find it difficult in setting aside some resources for the project and may prefer a pure grant from a matching grant scheme.

9. Matching grant is not clear in the contract documents

"*First, I think it is important for an investor or donor to consider the financial capability of the firm before calling for certain amount of matching grant. There should be an ex-ante evaluation of the private sector to see whether the deliverable can be obtained within the firm's financial year".*

Specificity of a policy is key especially during project execution. The 25% matching grant applied to all the firms regardless of the expected deliverables, financial magnitude of the project and the possible constraint a firm is likely to encounter. The informants were of the opinion that matching grant should be explicit from the onset of the project. The contract documents are not clear on how to operationalize the policy. The beneficiaries should be taken through the donor expectation at proposal signing, project implementation and finally the reporting stage. The informants also suggested a prior evaluation of every firm before awarding the contract to assess the capability of delivering the proposed matching grant required. This was in line with Farrant *et al.* (2018) and IFAD (2012) and Phillips (2001) that emphasized the need to customize matching grants based on the scope and objective of the project.

10. Matching grant should be customised per firm's need

"*R05: All I think that is wrong is that giving a contribution equal to X means commitment. This idea of giving a standard percentage as a commitment. I know it helps them in terms of calculation and it may be a nightmare when you vary the amount. But if you look at the business reality, that is what happens to the business syndicate. The business is very specific; they are not the same. In the previous projects we worked with, they vary the matching grant. We sit down together before signing the contract and negotiate."*

Informants had varied opinions on how to improve the matching grants model. Majority were of the opinion that matching grant should not be a proportion of the total grant amount. Instead, the donor should customize matching grant. The informants argued that firms have different potentials anchored on different production capacity and strategies. Hence, matching grant should not be applied as a blanket. It should be specific to the firm's need. When machineries are provided as a grant in order to avoid them being idle, the donor may require the firm to commit more of its resources as matching grant.

This was in line with Farrant *et al.* (2018) guidelines that offer different levels of matching grants where goods supported have a purely public or private benefit. The guidelines further stipulate that the closer the business association to private for-profit, the higher the expected match, the lower the match, the lower the beneficiary ownership, the higher the interest from the local politicians and the faster the disbursement rate. The reverse is true for the higher match. The guidelines further mentioned the need to assess the beneficiary knowledge, willingness and capability to make the required contribution (IFAD, 2016). From the matching grants projects studied, reports and review indicated that there are possibilities of emerging good practice to address the weaknesses of matching grants as an instrument.

11. Identify other tools to attract grantee commitment

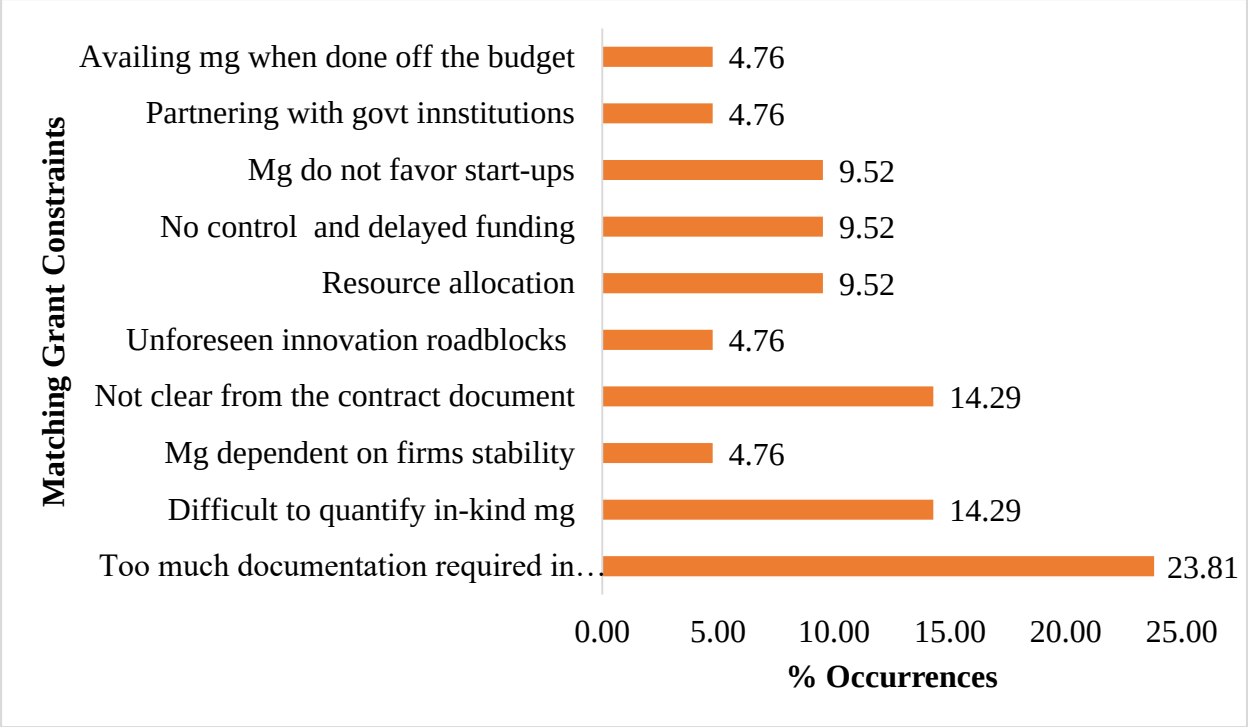
"*But where there is no capital investment, commitment can be made in some way that allows the person to provide after project life to help in continuity especially if you are entering in a new product that require promotion, marketing, matching grant can be committed towards post funding period. I know it is difficult to follow up, but I am sure there is a way of doing it to ensure a successful take off. Matching grant can kill the project or build it depending on how it was structured".*

Matching grant has in many projects been used as a way to attach a beneficiary commitment to the project. It is based on the commitment principle that resolves to pursue beneficiaries to fulfil their goal by daring to put their best foot forward since their resources are also involved. Some informants suggested that there may be need to re-evaluate the matching grant provided to take care of lapse in time by giving the beneficiary some level of control. Some recommended that matching grant for start-ups who do not have the benefit to accumulate assets can be stretched post funding period. This will ensure successful take off and sustainability.

12. Phase matching grants with funds disbursement

"*We write proposals and they are so beautiful... but the money is not phased with the 25% matching grant. In reality it is not there. It is based on results and the progress reports, not the matching grant. No progress, no money. The project has been using the progress but not matching grant.... they write it so well that the money will be provided based on the progress/ results".*

Despite matching grants being a mandatory requirement at the proposal and implementation stage, overtime, firms have gotten away with it and still received the full grants. Great emphasis is placed on the results and progress reports and not on matching grants. The policy lacks an enforcement mechanism that can put the firms to task of accounting for matching grants before funds are disbursed.



*Mg - matching grant

Figure 6: Summary of constraints from key informants' interviews

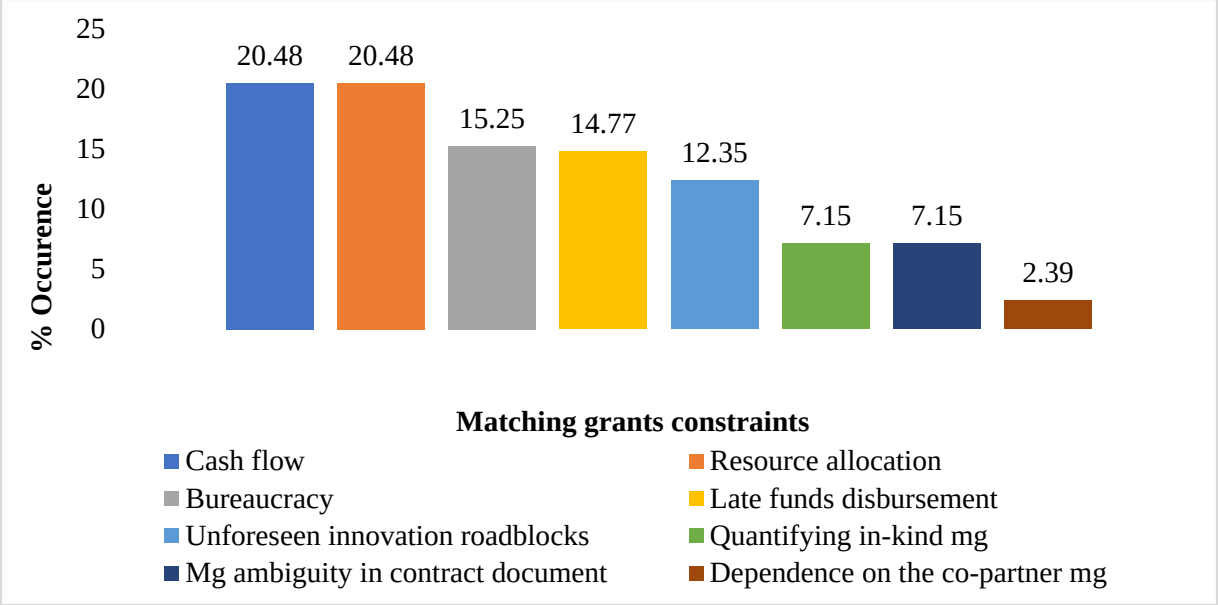
In the key informant interviews, documentation of matching grant was the main constraint contributing to 23.81% followed by difficulty of quantifying matching grants and unclear contract document contributing 14.9% each. These findings are supported by the Independence Evaluation Group and World Bank Group (2014), which concluded that even though matching grants

schemes were becoming popular as one of the best tool to support SMEs, it was challenged by implementation difficulties. Furthermore, the matching grants projects were weakly justified (IEG & WBG, 2014).

In addition, firms reported that matching grants do not favour start-up firms (9.52%) which are still struggling to build up a stable capital base. Results indicate that resource allocation (9,52%) to firms was a challenge in a situation where matching grant committed have a competing demand to the core business or other projects within the firm. The informants have no control of the project especially when funds are delayed (9.52%), thus hindering real time resource allocation of the firm. Other constraints included unforeseen innovation roadblocks (4.76%), availing matching grant when done off the budget (4.76%) and different operating protocols when a firm's operation is dependent on the others matching grant (4.76%). Lastly, the informants explained that matching grant committed is dependent on firm financial stability (4.76%). Thus, if a firm is financially unstable, then, it will have a challenge in providing matching grant.

4.2.3. Pooled agribusiness constraints from key informant interview and survey

The pooled constraints from both the survey and key informant interview are highlighted in Figure 7.



*Mg – matching grants

Figure 7: Pooled agribusinesses constraints from key informant interviews and survey

Matching grants can also be referred to as an internal financing of a project. The capability of internally financing a project is dependent on the firm's financial stability that may not favour start-up firms. Pooled results display common constraints with cash flow of a firm recording the highest occurrence at 20.48%.

Resource allocation tied with cash flow contributing 20.48% of the total constraints. Firms indicated that real time allocation of matching grants was difficult especially if there were delays in financing the project. In addition, there were challenges of resource allocation in an event that there was a competing demand from other projects. Likewise, allocating matching grants when it was not budgeted for within the financial year was not easy. Moreover, it was difficult to project the long-term capability of a firm in providing matching grants.

Bureaucracy was the third most occurring constraint with 15.25% of the total constraints. Firms complained of too many procedures in documenting and reporting matching grants. Lack of clarity in the contract document was also mentioned. Late disbursement of funds was fourth with a cumulative of 12.35%. In the event that the funds delayed, firms were forced to use their reserves plus the matching grants committed in implementing the project.

Fifth, difficulty in quantifying in-kind matching grants cumulatively recording 7.15%. This was attributed to lack of appropriate tools to account for matching grant. Thus, the effect of matching grant schemes in agribusiness innovation may not easily be determined. Campos *et al.* (2014) in a report to World Bank Group review of 2014, concluded that matching grants schemes rarely yield the type of broad and durable economic benefits that would justify the subsidization of private enterprises with public funds.

Contract document currently in place was not clear on how to operationalise matching grants contributing to 7.15% of the total constraint. Finally, in an event that the project majorly depended on the co-partner's matching grant and the co-partner fails to remit on time, then the project is likely to fail. This contributed to 2.39% of the total constraints.

4.2.4. Possible mitigation measures

Firms recommended different mitigation mechanism in easing the impact of the constraints reported in section 4.2.1. to 4.2.3. First, the informants stated that matching grant should not be a proportion of the total grant amount. Instead, the donor should customize matching grant considering firms' potentials anchored on their different production capacity and strategies. Hence,

matching grant should not be applied as a blanket but be customised or tailored to the locally prevailing conditions of the beneficiary and the investors' target to the market failures (Phillips, 2001).

Second, the grantee should negotiate with the grantor on what to provide as matching grant before project implementation in addition to having a strategic plan. This will enable the firms to concentrate on core business and effectively manage the competing demand of resources from different projects.

Some informants recommended that they be allowed to report in-kind matching grant in non-monetary form. For instance, if the firm committed to train farmers as a way to match the grant, then, the firms can report the number of trainings held and the number of people trained as a proof of matching grants. Other suggestions included buying in management, development of a marketing strategy for the innovated product, setting clear deliverables and empowering agribusinesses to fast-track procurement of the materials needed. Operationalizing matching grants in the contract documents and manuals. Finally, phasing matching grants with funds disbursement.

4.3 Firm characteristics that influence the choice of matching grants by agribusiness firms

In this section, findings of firm characteristics that influence matching grant choice are discussed.

4.3.1 Description of firm characteristics

The descriptive results of firms' characteristics are shown in Table 6.

Table 6: Descriptive characteristics of agribusiness firms in Eastern Africa

No	Firm Characteristics	Frequency	Percent (%)	Cumulative
1	**Age of firms (Years)**			
i.	Young (1-5)	8	26.67	26.67
ii.	Middle (6-10)	12	40.00	80.00
iii.	Old (11-15)	4	13.33	40.00
iv.	Older (>15)	6	20.00	100.00
2	**Ownership structure**			
i.	Sole proprietor	2	6.67	6.67
ii	Partnership	1	3.33	10.00
iii	Corporation	4	13.33	23.33
Iv	Limited Liability Company	20	66.67	90.00
V	Society/ Group	3	10.00	100.00
3	**Management structure**			
i	Mechanistic/Tall	11	36.67	36.67
ii	Organistic / Flat	8	26.67	63.33
iii	Matrix/ Mixed	11	36.67	100.00
4	**Size**			
i	Micro (1-20 employees)	19	63.33	63.33
ii	Small (21-50 employees)	5	16.67	80.00
iii	Medium (51-100 employees)	2	6.67	86.67
iv	Large (>100 employees)	4	13.33	100.00
5	**Location**			
i	Rwanda	2	6.67	6.67
ii	Burundi	1	3.33	10.00
iii	Ethiopia	2	6.67	16.67
iv	Kenya	13	43.33	60.00
v	Tanzania	6	20.00	80.00
vi	Uganda	6	20.00	100.00

The results indicated that 27% of firms were aged 1-5years, 40% were between 6-10 years, 13% were 11-15 years while only 20% were above 15 years as shown in Table7. Firms below 5 years are referred to as entrants while those above 5 years of establishment are incumbents. BioInnovate Africa Phase II projects were geared towards exploitative R&D and applied incremental agribusiness innovation. The large participation of the incumbents in BioInnovate Phase II programme is driven by the interest to operate more efficiently and make more profits while adopting the exploitative R&D. This confirms Coad *et al*. (2016) findings that entrants are more interested in exploratory R&D and radical innovation unlike incumbents. Incumbents have a higher affinity to absorb innovation failures compared to the entrants due to the large accumulation of profits over time. Older firms are characterised by accumulated assets, self-finance their innovation budgets (Coad *et al*., 2016).

Ownership structure represented the liability burden of a firm. The results indicated that 66.67% of the firms were limited liability companies, 13.33% were corporation, 10% were groups and societies, 6.67% were sole proprietors, while 3.33% were in partnership. The findings confirm the results by Dong and Men (2014) that limited liability company as the main form of ownership were most preferred by investors and donors. Investors consider company incorporation as a positive indicator for a firm's trustworthiness and commitment to operational laws (Tam & Tan, 2007; Welch, 2003). Incorporation of company gives an investor a guarantee of perpetual succession and confidence of holding a firm liable in case of a breach of contract. Thus, incorporated firms are highly favoured by financiers as opposed to those that are not.

Management structure represented how firms organized their human capital resources to accomplish its goals. Organistic / flat structure represented the NGOs and private sector were the least with 26.6%, mechanistic/tall structure that represented government institutions and matric structure that is a blend of mechanistic and organistic had 36.6% each. The results depicted the multi-sectoral collaboration; governments, private sector, civil society organizations, farmers' organizations and research bodies; stakeholders' involvement and interests in agribusiness innovation aimed at enhancing inclusive economic growth within the region (GoK, 2018). The multi-sectorial approach promoted free and fast flow of innovation knowledge and technology through open innovation in agribusiness sector.

The number of employees per firm were used to depict firm size having proven to be more consistent and a stable measure across all industries and times (Coad & Hölzl, 2012; Davidsson &

Delmar, 1997; Karlsson, 2020). Micro enterprises represented 63% of the total number of firms, small enterprises 17%, medium enterprises 7%, while large enterprises 13%. Medium and large firms are known to possess large stocks and profits meant to cushion innovation failures. Thus explaining their low participation in innovation programme such as BioInnovate Africa Programme (Coad *et al.*, 2016). The high participation of micro enterprises in the programme explains the firms overreliance on investors and well-wishers in conducting technological innovation programmes (Eniola, 2017). Most small firms do not have a budget for innovation programmes, rather, are always hopeful to receive innovation support from either government, investors or donors.

Location indicated the country where the firms were operating. Whereby, 43% of the firms were from Kenya, 20% from Uganda and 20% from Tanzania, 7% from Ethiopia and 7% from Rwanda while Burundi had the least number representing only 3% of the total firms. Kenya managed to get the highest ratio due to the fact that they are the host country to the project having proximity advantage over other countries. This is supported by Eniola (2017) that confirmed that, firms that are closer to the lenders have an advantage over those that are far in utilizing quality information related to credit. The lenders too would prefer to lend to firms that are closer for ease of assessing their credibility. Monitoring and follow up of such firms is equally is easy. Firms located away from the lenders are disadvantaged in creating a personalised relationship with the lenders and in accessing information related to external funding opportunities (Keeble, 1997; Storey, 1994). This proofs the reason why most firms are concentrated within the vicinity of the host country and even town.

4.3.2. Firm characteristics and the choice of matching grant

In this section, the influence of firm characteristics on the choice of matching grants provided by agribusiness firms are presented. It was estimated using GSEM- MML maximum likelihood.

A comparison of the matching grant outcome was done among “both” and “in-kind”, “both” and “cash”, and “in-kind” and “cash” in column (1) and (2), (3) and (4), and (5) and (6) respectively. A positive coefficient shows that a firm is more likely to choose one matching grant category over the other category as shown in Table 7. Contrary to previous studies on firm characteristics, this study included management structure as a variable to be estimated.

Table 7: Influence of firm characteristics on the choice of matching grant

Base outcome	**Both**		**In-kind**		**Both**		**Cash**		**In-kind**		**Cash**	
Alternating Outcome/Firm Characteristics	**In-kind (1)**		**Both (2)**		**Cash (3)**		**Both (4)**		**Cash (5)**		**In-kind (6)**	
	Coef.	p	Coef.	p	Coef.	P	Coef.	p	Coef.	p	Coef.	p
Age (yrs**)**												
1-5	-1.703	0.39	1.703	0.39	2.597	0.030**	-2.597	0.703	4.3	0.063	-4.3	0.796
11-15	-0.732	0.714	0.732	0.714	2.879	0.053***	-2.879	0.788	3.611	.	-3.611	0.67
>15	-25.673	0.000*	25.673	.	32.462	.	-32.462	.	58.135	.	-58.135	.
Firm size (No. of employees)												
21-50	-22.011	.	22.011	.	-8.699	0.000*	8.699	.	13.311	.	-13.311	0.000*
51-100	-21.714	0.000*	21.714	0.000*	1.539	0.233	-1.539	.	23.253	0.000*	-23.253	0.000*
>101	21.863	.	-21.863	.	36.2	0.000*	-36.2	.	14.337	.	-14.337	.
Management structure												
Mechanistic	-0.964	0.6	0.964	0.6	-28.612	0.000*	28.612	.	-27.648	0.000*	27.648	.
Organistic	22.125	0.014**	-22.125	0.000*	10.353	0.000*	-10.353	0.503	-11.772	.	11.772	.
Ownership structure												
Partnership	42.452	.	-42.452	.	57.786	0.000*	-57.786	0.003*	15.334	.	-15.334	0.314
Society/ Group	-17.338	0.000*	17.338	.	-44.342	0.000*	44.342	.	-27.004	0.000*	27.004	.
Sole proprietor	-2.309	.	2.309	.	7.648	0.000*	-7.648	.	9.957	.	-9.957	.

*p < .01, ** p < .05, *** p < .10

Location (country)												
Rwanda	-24.683	.	24.683	.	33.715	0.000*	-33.715	.	58.398	.	-58.398	0.000*
Burundi	-19.183	0.000*	19.183	0.000*	-4.124	0.000*	4.124	0.02**	15.059	0.000*	-15.059	0.000*
Ethiopia	-20.202	0.000*	20.202	0.000*	-38.744	0.000*	38.744	.	-18.542	0.000*	18.542	0.000*
Tanzania	0.011	0.997	-0.011	0.997	-2.282	0.182	2.282	.	-2.293	0.385	2.293	0.658
Uganda	1.818	0.457	-1.818	0.457	-1.813	0.388	1.813	0.533	3.631	.	-3.631	0.3
_cons	0.732	0.597	-0.732	0.597	-20.332	0.000*	20.332	0.135	-21.064	0.000*	21.064	0.000*

Holding middle aged firms (6 -10 years) at the base, young firms (< 5 years) are more likely ($\alpha = 2.597$, $p = .00$) to choose cash form of matching grants over both. This is supported by Mabula (2019) and Kira and He (2012) that firms with less than 5 years in operation are less likely to rely on debt financing from lender over equity financing. Old firms (11-15years) are more likely ($\alpha = 2.879$, $p = .053$) to choose both over cash forms of matching grant. This is due to the fact that as a firm's age increases, they are capable of accumulating assets in terms of office space, human resource, machinery and intangible assets thus prefer to offer them as matching grants over both form of matching grant. Older firms (>15 years) are less likely ($\alpha = -25.673$, $p = .00$) to choose in-kind matching grants over both. Firms above 15 years are more prudent in risk management and will try to diversify their financing sources to minimise risks.

Kira and He (2012) revealed a hypothetical existence of a positive relationship between firm's age and access to both debt and equity finance especially by SMEs. The age of a firm is positively related to the firm's asset accumulation thus, younger firms had a higher probability of choosing cash while the older firms had a higher probability of choosing in-kind or both form of matching grant. This was contrary to Fiegenbaum and Karnani (1991) who established that age was not significant on the financial performance and liquidity of the firm.

With respect to firm size, firms with 1-20 employees represented micro enterprises, 20-51 employees were small enterprises, 51-100 employees were medium enterprises and <100 employees were large scale enterprises. Holding micro enterprises at the base, small enterprises were less likely ($\alpha = -8.699$, $p = .00$) to choose cash over both and less likely to choose in-kind over cash form of matching grants. Medium size enterprises had a higher probability ($\alpha = 21.714$, $p = .000$) of choosing both form of matching grant over in-kind and a higher probability ($\alpha = 23.253$, $p = .00$) of choosing cash over in-kind matching grants. Large firms had a higher probability ($\alpha = 36.200$, $p = .00$) of choosing cash over both. This was supported by Kira and He (2012), Mahfoudh (2013), and Mwaebia (2017) who revealed that firm size was positively related to firm's liquidity, financial performance and access to debt financing.

Management structure represents how an institution organises its human resources to accomplish its mandate. Mechanistic structure generally represents well established institutions with clear guidelines and policies while organistic structure comprises of private sectors and NGO's. Matrix structure are majorly a combination of the functional and project type organizations. Holding matrix at the base, government institutions are more likely ($\alpha = 28.612$, p

= .00) to choose both over cash and more likely (α = 27.648, p = .00) to choose in-kind over cash form of matching grant. This is justified by the over endowment of resources such as machinery, office space and human capacity within such institution and minimal liquidity or cash flow to run institutional programmes. Thus, government institutions are less likely to offer cash as matching grants. Contrary to the government institutions, private sectors operating under profit maximization principle, are less likely to hold assets that are not under production. Thus, are more likely (α = 10.33, p =.00) to offer cash over both and more likely to choose in-kind over both (α = 22.125, p = .00).

Ownership structure represented a firm's liability and asset ownership of a firm. Holding limited liability companies as the base category, firms under partnership are more likely (α = 57.786, p = .003) to choose cash over both form of matching grant. Societies or groups which are majorly formed by farmers and/or coordinated by NGO's are more likely (α = 17.338, p = .00) to choose both over in-kind. They are more likely (α = 44.342, p = .00) to choose both over cash and in-kind over cash (α = 27.004, p = .00). Sole proprietors are more likely (α = 7.648, p =.00) to choose cash over both form of matching grant. This was confirmed by Mabula (2019), Kira and He (2012) and, Fatoki and Asah (2011) who found a positive association between debt financing and ownership structure concluding an existing positive relationship between incorporation and access of debt financing by SMEs.

Location represented different countries where of the beneficiary firms are located. Kenya was used as the base category due to the following reasons: first, it had the majority firms and second, BioInnovate Africa was located in Kenya hence a basis for comparison. Firms from Rwanda were more likely (α = 33.715, p = .00) to choose cash over both form of matching grants and choose cash over in-kind matching grant. Contrary, firms from Burundi and Ethiopia were less likely (α = -4.124, p = .00 and α = -38.744, p = .00) respectively to choose cash over both. This was also confirmed by Kira & He, (2012) that there was a positive relationship between firm's location and access to debt financing by SMEs. Burundi and Ethiopia are also more likely (α = 19.183, p = .00 and α = -2.202, p = .00) to choose both over in-kind matching grant. Rwanda firms are less likely (α = 15.059, p = .00) to choose in-kind matching grants against cash form. Burundi firms are more likely to choose cash over in-kind. While Ethiopia firms are less likely (α = -18.542, p = .00) to choose cash over in-kind matching grant.

4.4. Institutional factors that influence the choice of matching grants by agribusiness firms

The task for this study was to establish what informs a firm's choice of matching grant. Various firms had developed different mechanisms of determining what to provide as matching grants. The study found that the choice of matching grant was majorly governed by informal and formal institutional factors that had been developed cognitively over time inform of practices, guidelines and policies. The interest was also on factors that donors should consider in determining a matching grant type and proportion in order to improve the model and, enforcement mechanism currently in place for these institutional factors.

4.4.1. Firm practices

The choice of matching grant was dependent on the following factors: first, the nature of the project that was funded, the level of investment and the expected deliverables. Before committing a firm's resources, the informants were concerned with the type of project they were getting into. Firms provided matching grant based on the orientation of the project, either market or product oriented. Level of investment also played a role in choosing matching grants. For instance, if a firm has assets and required only running expenses, then, it was likely to provide assets as matching grant and vice versa. The lifespan of the project and production burden experienced by the beneficiary was also considered before choosing a matching grant.

Second, firms ensured that the matching grant provided were in line and significant to the core business of the firm. Firms did not just get into businesses, but critically evaluated the projects before committing firms' resources as matching grant. All the firms were already in operation at the start of the project hence, the matching grant provided was within the firms' road map or strategic plan.

Third, informants were keen on the business opportunities of the firm. Like any other business, agribusiness main aim is to make profits. Firms were more interested in the present and future benefits of their investments. Agribusiness innovation enabled the firms to increase the profit margin by either reducing their production costs or by increasing production volumes. The informants considered the potential business opportunities of a firm before choosing a matching grant.

Fourth, matching grant choice was dependent on firms' core businesses. Informants reported that since each project had different co-partners within the six countries, the firms were mandated to identify what was missing in the mix and offer it as matching grants to blend with the co-partners based on their unique roles in the project. This was done at the proposal development level. For instance, service-based firms offered in-kind matching grants such farmers' networking and mobilization, while product-based firms offered assets such as machinery, staff, and land.

The informant's professional background and experience also played a role in selecting matching grant. Firms that had prior experience with matching grant element were able to use their experience with different donors in choosing the matching grant. Professionalism, interests in innovation and training of accountants offered by BioInnovate Africa also featured in the selection criteria.

All the respondents seemed to be contented with their respective practices they had employed in selecting matching grant. The practices allowed them to be flexible and reallocated resources based on need. The informants acknowledged that the practices employed were not 100% perfect, and they had some teething problems. The firms confirmed that they persistently review their practices to suit the donors' demands.

4.4.2. Firm guidelines

Majority of the informants reported that they did not have any guideline in form of rules, regulations or policies governing the selection of the matching grant. The selection criteria were mainly via informal practices that had been in existence. Some informants felt that development of guidelines in form of policies to govern the provision and implementation of matching grants were uncalled for, stating that, matching grant is always at the discretion of the donor and the type of project. There is also little room for altering the donors' policy since beneficiaries are at the receiving end and the donors support to is voluntary.

Informants were divided on the need to develop a matching grant policy. SMEs felt that there was no need as their production was based on market trends. Furthermore, their scale of production was a hindrance to any substantive policy development. Large firms termed the grant as a drop in the ocean and had little influence on the output thus may not necessitate policy development adding that, this may cause them to divert from their core business. Despite negative perceptions and justification for not having a policy on matching grants, majority felt that there was need to develop

one and suggested that the policy developed should be multi-disciplinary in nature not a far-fetched idea beyond an institution's capability.

Out of 12 firms, only 2 reported to have developed guidelines that regulated firm operations including travel, equipment, salaries, office space costs and investors/donor engagement. The policy document is used in computing the firm costs and determining matching grants provided. The policy determined for instance, who owns the machinery provided as a grant once the project winds up.

4.4.3. Enforcement mechanism

Firm guidelines and practices played a key role in determining the type and amount of matching grants provided. To ensure the guidelines and practices are upheld, firms developed different enforcement mechanisms. Key among these mechanisms includes negotiation, regular audits and updates in meetings and reports. Some informants reported that before signing the project contract, they sit down as a team with the donor to have a common understanding of what to provide based on the firm's resources, background and business opportunity foreseen. Regular project updates during the board meetings and audits were also employed to enforce the firm guidelines and practices. Other mechanism employed included regular evaluation of the project performance and strict adherence to the manual and exercising high level of integrity.

4.4.4. Factors to consider in developing agribusinesses matching grants model

Respondents were asked to state what the investor need to consider before designing a matching grands' model for agribusiness firms. The response was as follows:

"*Re-align the financial year with the project's matching funds requirement. Look at the financial muscles of the company, the professional capacity, the history and delivery status of the organization. Consider asset depreciation, exchange rate and the dollar depreciation".*

"Market down approach is very important. Find out more on the market information: what is the adoption rate? How is the target market? How quick can the product be adopted in order to recoup their money to be able to break out for that period? You may have a product that has been funded, there is a niche for it but the uptake of the product is not as fast as envisaged".

"Some technology that are moved from laboratories to field need to be given some patience. The donor may not be able to evaluate. What I know is that the entrepreneurs can never go wrong. There are

some projects that cannot go far. If it is a project, it is ok, but if it is an enterprise, then you must think about its continuity and technological viability in the market before committing a firm's resources as matching fund".

"You should have an interest of the project from the word go. What is my interest in the project? Is it to my interest that the project succeeds?"

"We write proposals and they are so beautiful... but, the money is not phased with the 25% matching fund. In reality it is not there. It is based on results and the progress report not the matching fund. The project has been using the progress reports and not matching fund. They write it so well that the money will be provided based on the progress and results".

"Matching fund should not be a blanket you can't use matching fund for everything. Consider the stage of development of the firm. You can't use it for every activity. For example, someone who has machinery, you may need to give him a working capital. Matching fund must be specific not one side speaks all, not a blanket".

"All I think that is wrong is that giving a standard contribution equal to x% as commitment. I know it helps them in terms of calculation and it is a nightmare when you vary the amount. But if you look at the business reality, that is what happens to the business syndicate the business is very specific they are not the same. In the previous projects we worked with, they vary the matching fund. It is something that we sit down together before signing the contract and negotiate".

The study indicated that matching grant model can be improved in the following ways: First, agribusinesses firms must develop an interest in supporting and collaborating with other stakeholders in promoting innovation. Second, by training project accountants and financial managers involved in innovation projects on how to apportion and account for matching funds. Third, by prudently assessing the technological viability, future market opportunities and challenges the innovative products is likely to experience in the market. Fourth, by phasing matching fund contribution with the funds disbursement in the contract document. Finally, matching fund need to be tailored according to the specific firm structure and needs. The results of the extract are as represented in Figure 8.

Figure 8: Factors investors should consider in setting matching grant proportion

Factors that investor should consider prior to designing the matching grant model were discussed. The results indicated that level of investment scored the highest with 16.67%. The informants felt that the donor should consider the level of investment made by a particular investor in terms of firms' tangible and intangible assets required to support the project. Second, financial calendar and responsiveness of a firm was second with 12.5% and return on investment was 12.5%. The informants suggested that investors need to consider a firms' business opportunity in terms of returns to investments as a result of the project.

The avenues and linkages that the firms are likely to open up to as a result of undertaking the project; market opportunity and the commercial viability in terms of adoption rate of agribusiness innovation products contributed 8.33%. The nature of the project for instance, whether the output is product oriented or market oriented and, the time frame required for delivering the output contributed 8.33%.

Technological viability also featured as a factor to consider in the discussion scoring 8.33%. The informants felt that some technologies are rushed to the market without analysing their

commercial viability. There was need to assess the possibility of innovated products penetrating into the market. This should assist in determining the level of matching grants. The lower the viability the lower the matching grant commitment.

The product development stage was also discussed contributing 8.33%. The investors need to understand the product stage a firm is operating at before setting a matching grant level. The matching grant committed should be able be realigned to the market mix strategy in steering the products through different stages of product development. If they are at introduction, then, they should commit more on product awareness; at growth, additional market segment while at maturity period increase shares to extend the product life cycle. At decline stage, a firm may choose to reduce the product line and only concentrate on the profitable once.

The professional capability of the firm scored 8.33%. The firms were of the opinion that investors need to consider the experience and technical capability necessary to run the project. Finally, the firms' interest, the core business and firms' policies in place that enhance accountability accounted for 4.17%.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

Understanding a matching grant model for financing agribusiness innovation is imperative in promoting technology adoption. Matching grant enhances agribusiness firms' ownership, partnership, commitment and guarantees project performance. The study stands out to prove the possibilities of emerging good practice to address the weaknesses of a matching grants instrument through documentation. Agribusiness firms mostly preferred a combination of cash and in-kind form of matching grant, while they least preferred cash only due to cash flow challenges in running the projects. BioInnovate Africa phase II grants matching grant was ranked moderate and fair compared to other similar projects. Real time resource allocation, inadequate cash flow, difficulty in reporting in-kind matching grant and late disbursement of funds were some of the constraints that hindered agribusinesses from complying with the matching grant scheme's requirement. Little emphasis and lack of clarity of matching grants in the contract contributed to laxity in documenting matching grants.

Institutional factors such as firm practices and guidelines had a great influence on the choice of matching grant by agribusiness firms. Few firms had developed and documented policies and guidelines that informed matching grant choice. However, majority relied on undocumented firm practices that had cognitively been developed overtime. The study revealed that firm characteristics such as size, age, ownership, location and management structure were significant to the choice of matching grants. Therefore, the study confirms the feasibility of customizing, operationalizing and improving matching grant model in donor financing for agribusiness innovation in Eastern Africa. The results of the study may be used to inform policy and practice of allocating innovation funds in the sector.

5.2. Recommendations

Development agencies, investors, public and private sector involvement in promoting agribusiness innovation is crucial for promoting inclusive economic growth. Co-financing and public private partnerships are key in enhancing innovation infrastructure and pathways for

development. However, there are policies that require restructuring if agribusinesses are to be competitive to meet the demand at hand.

First and foremost, grantors need to limit matching grants to the vital or most preferred only rather than leaving the firm make random choices that may complicate costing and reporting mechanism. The investors can narrow down the matching grants list and provide a costing framework for each matching grants category as per the costing framework provided

Second, there is need to critically assess the matching grants model's fitness in promoting innovation technologies in agribusiness sector. Investors should address the binding constraints that might hinder agribusinesses in accessing innovation opportunities such as increased efficiency, improved profitability, business linkages and partnership.

Third, apart from progress and result reports, there is need to develop an enforcement tool that ensures beneficiaries appropriately accounts for the matching grants they provide before the next tranche of funds are disbursed. The investors should also ensure the contract documents are explicit to the project and a costing framework attached to the contract.

Fourth, since firms are structurally unique in terms of their potentials and possible risks, a blanket matching grant model is not appropriate for financing innovation activities. Hence, investors should customize the matching grant model based on a firm's need by considering the level of firm's investment, stage of product development, market opportunities, nature of the project, expected deliverables, and, technology and commercial viability of the product. In addition, the investors should consider the structural differences of the firms in terms of size, location, age, ownership and management structure that are significant in determining the choice of matching grant

Fifth, even though the firms may seem contented with the undocumented practices, there is an urgent need to persuade them to move to the next step of documenting their matching grants practices to either guidelines or policies for ease of reference, enforcement and performance assessment.

Finally, BioInnovate Africa and other investors should create more awareness through workshops, trainings and meetings on the need to account for matching grants in a project. The firms can be taken through the matching grants costing and reporting framework. This will ensure that the investors and beneficiaries are acquainted with matching grants.

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APPENDICES:

Appendix 1: List of agribusinesses beneficiaries of BioInnovate Africa phase II grants

No.	Name of the Firm	Project	Project Code	Country	Location/ Town
1	Innovative Technology and Energy Centre	A regional enterprise to commercialize an integrated technology for waste water treatment and bio-waste conversion in eastern Africa	P01	Tanzania	Zanzibar
2	East Africa Nutraceuticals Limited	Adapting refractance window drying technology to produce high quality fruit and vegetable bio-products	P02	Kenya	Nairobi
3	Food and Nutrition Solutions Limited			Uganda	Kampala
4	Tonnet Agro-Engineering Company Limited			Uganda	Kampala
5	A to Z Textile Mill Limited	An integrated push-pull area wide country of tsetse flies in East Africa	P03	Tanzania	Dar es Salaam
6	Lake Basin Development Authority	Bio-alkanol gel fuel for rural household in the Lake Victoria Basin	P04	Uganda	Bisitemi
7	Biobuu Kenya Limited	Black Soldier fly larvae as an alternative and affordable protein for chicken and fish	P05	Kenya	Kilifi
8	The Recycler Limited			Tanzania	Dar es Salam
9	Bio-Innovations Company Limited	Developing an innovation-led bio economy strategy for Eastern Africa	P06	Uganda	Kampala
10	Agrarian Systems Limited	Insect-based agribusiness for sustainable grasshopper and crickets production and processing for food in Kenya and Uganda	P07	Uganda	Kampala
11	Treasure Feeds Limited			Kenya	Juja
12	MIMEA International Kenya Limited	Integrating ICT and portable diagnostic kit in commercial production on high quality tissue culture based sweet potato planting materials in East Africa	P08	Kenya	Kitengela
13	SENAI Farm Supplies Limited			Uganda	Kampala
14	Guavay Company Limited	Nitrogen bio fortified and palletized commercial grade organic fertilizer made from urban bio-waste to improve soil productivity	P09	Tanzania	Dar es Salam
15	Tursam Investment Limited			Uganda	Kampala
16	Global Agro Concept Limited	Optimizing mushroom value chain benefits for better livelihood and environment protection among smallholder and SMES	P10	Tanzania	Dar es Salam
17	OKOA Society NGO			Tanzania	Dares Salaam
18	Euro-Ingredients Limited	Orange flesh sweet potato (OFSP) puree for bakery application in Eastern Africa	P11	Kenya	Nairobi
19	The Women's Bakery Limited			Rwanda	Kigali

20	Agri-Seed Company Limited	Partnership to deliver market striga weed resistant maize and finger millet varieties in Kenya and Uganda	P12	Kenya	Nairobi
21	Green Enzyme Technologies Limited	Piloting use of novel enzyme for local bacterial isolates for ecofriendly processing of hides and skins	P13	Kenya	Nairobi
22	Lasting Solutions			Kenya	Nairobi
23	Gudie Leisure Farm	Plant extract to prevent malaria in East Africa	P14	Uganda	Kampala
24	Jicho Communicative Limited			Tanzania	Zanzibar
25	Karire Products			Burundi	Bunjumbura
26	R&G Investments Limited			Uganda	Kampala
27	Vector Health International Limited			Tanzania	Dar es Salam
28	Aroma Honey Toffee Limited	Production of high-quality Aroma Honey Toffees	P15	Uganda	Kampala
29	Salongo Rehabilitation Group			Uganda	Bisitemi
30	Union of Beekeepers of Gishwati			Rwanda	Kigali
31	Hottiserve East Africa Limited	Promoting smallholder access to fungal biopesticides through public partnership in East Africa	P16	Kenya	Nairobi
32	Kenya Biologics Ltd			Kenya	Kakuzi
33	Real IPM Kenya			Kenya	Thika
34	Kibwezi Agro Limited	Promotion of postharvest disinfestation of key horticultural crops in Kenya and Uganda	P17	Kenya	Makueni
35	Sulma Foods Limited			Uganda	Kampala
36	Bomvitae Agro-Industries Limited	Small scale community bio refining of sorghum for food, sugar and biomaterials in rain fed areas in East Africa	P18	Uganda	Kampala
37	Soil and More Ethiopia Composting Plc			Ethiopia	Addis Ababa
38	Scinnovent Centre Limited	Unlocking the commercial potential of new sorghum and millet products for improving nutrition and socioeconomic gains in Eastern Africa	P19	Kenya	Nairobi

Appendix 2: Informant consent instructional form

INTERNATIONAL CENTRE FOR INSECT PHYSIOLOGY AND ECOLOGY (ICIPE)

Study Title: Assessment of a Matching Grants Model for Financing Agribusiness Innovation in Eastern Africa.

Principal Investigator: Susan Amukoa

IRB No.: PI Version Date:10/06/2020

What you should know about this study

- You are being asked to join a research study.
- This consent form explains the research study and your part in the stud.
- Please read it carefully and take as much time as you need.
- You are a volunteer. You may choose not to take part at all, and if you join, you may quit at any time. There will be no penalty if you decide to quit the study.
- During the study, we will tell you if we learn any new information that might affect whether you wish to continue to be in the study.

Purpose of research project

This study is being done to assess the fitness of the current matching grants (MG) structure for the financing of agribusiness innovation in East Africa. The study aims to establish the constituents, effects and challenges experienced by agribusiness firms in providing the mandatory matching grants. Based on the findings, recommendations will be made for an effective MG Model fit for financing agribusiness innovation in the region.

Why we are asking you to participate

You are being asked to join this study because your firm is one of the agribusiness entities that is required to provide matching support for the grants you receive from BioInnovate Phase II grants or other funders.

Study procedures

If you join this study, we will ask you to do the following things. Fill a questionnaire and or participate in a key informant interview. The interviewer will ask you some questions regarding the current Matching grant model. You may also be requested to join a focus group discussion at a location nearest to you. The interviews or focus group discussions will be audio recorded for purposes of accurate data analysis and report writing. The recordings will be kept confidential and erased after the final report of the study is prepared.

Risks/discomforts

The study will involve disclosure of your firm's information, for example, on the type of goods or services, human resource/technical capacity, asset ownership and revenue base. There is a likely

risk of a breach of confidentiality, which may lead to economic risk if disclosed. The Investigator is under obligation by *icipe* and Egerton university to treat all confidential information with utmost confidentiality and has thus put in place relevant steps to safeguard confidential data. The information will too be coded to enhance confidentiality of the firms. In reporting the individual data of the firms and absolute figures will be kept confidential.

Benefits

By participating in this study, your views and opinion will be taken into consideration while developing the Matching grants model for financing agribusiness innovation. The study will also be able to capture the views on the constituents, effects and challenges of the current Matching grant structure in an effort of making it better and workable.

Payment

There is no payment for participation in this study.

Data Sharing

Authorized Disclosure of Research Data

Data sharing will be permitted including those who may access the consent documents such as the sponsor, study monitors, or reviewing ethics committees and regulatory bodies who are charged with the responsibility of making sure the study is properly conducted. The result of this study may be shared through a thesis or publication.

Data Confidentiality

Protecting Data against Unauthorized Disclosure

We will remove direct identifiers (such as the name of the firm) and instead code your information before sending it to the repository**.** The repository is a controlled-access repository that is only available to researchers and companies. Even though the studies may involve the risk of a breach of confidentiality from unpermitted disclosure of identifiable information to unauthorized individuals. The risk will be minimized through protection of study data and use of good security practices. The study information is protected by a Certificate of Confidentiality. This Certificate allows us, in some cases, to refuse to give out your information even if requested using legal means.

Cost of participation in the study

The study will only require your time. However, the study may provide you with transport reimbursement if you are required to travel to attend a focus group discussion.

What happens if you leave the study early?

You may leave a study early either because it is your choice, or it is the decision of the Investigator and/or the sponsor. For example, if you no longer meet study eligibility criteria, or may not be compliant with study procedures. The reasons for that decision will be explained to you. The data collected prior to your departure will not be used.

What are the risks to your privacy?
The study will not collect any personally identifiable information, save for general information about your contacts, educational background and work experience. Any personally identifiable information, which is inadvertently collected will be kept confidential and destroyed.

Ending Consent
You may end your consent at any time. Information obtained and used before you end your consent will continue to be used for research. If you wish to end your consent, let us know.

Who do I call if I have questions or problems?

- Call the principal investigator Susan Amukoa at +254 723 534 453

- Call or contact the International Centre for Insect Physiology and Ecology (icipe)/Egerton University if you have questions about your rights as a participant of a study participant. Contact the NACOSTI if you feel you have not been treated fairly or if you have other concerns.

The contact Address is:

International Centre of Insect Physiology and Ecology (*icipe*)
P.O. Box 30772-00100 Nairobi, Kenya
Tel: +254-20-8632000
Fax: +254-20-86322001/8632002
Email: *icipe@icipe*.org

What does your signature on this consent form mean?

Your signature on this form means:

- You have been informed about this study's purpose, procedures, possible benefits and risks.
- You have been given the chance to ask questions before you sign.
- You have voluntarily agreed to be in this study.
-

_____	_____	_____
Name of Participant	Signature of Participant	Date
_____	_____	_____
Name of Obtaining Consent	Signature of Person Obtaining Consent	Date

Give one copy to the participant, if s/he wishes to have one, and keep one copy in your study records

Appendix 3: Key informant interview

ASSESSMENT OF A MATCHING GRANTS MODEL FOR FINANCING AGRIBUSINESS INNOVATION IN EASTERN AFRICA

Interviews with key informants will be used to collect additional information from agribusiness firms that are beneficiaries of the BioInnovate Africa phase II grants or that are required to provide matching grants by other funders. Only Project Leaders or Co-project leaders will be considered key informants:

Administering the Key Informant Interview

When conducting an interview:

i. The interviewer will read the introduction section to each participant at the beginning of the interview and ask them to sign an informed consent form.
ii. Explain to the person being interviewed that participation in the interview is voluntary and ask them to read and sign the informed consent form.
iii. Conduct the interview in a team of two. One person will ask the questions, and the other will record the responses, both in writing and by audio recorder.
iv. After each question you will find specific instructions in BLOCK LETTERS. Do not read the instructions to the respondent. These instructions are meant to help you in completing the interview.
v. Check the relevant box for each answer.
vi. When rating scales are used, read the complete scale and obtain an answer within the same scale.
vii. Ask additional probing questions if needed and where indicated.
viii. Write responses word for word on the space provided, so that they are clear and understandable to others.
ix. Do not summarize. Continue writing on the back of the page, if needed. If the response is very long, or it was difficult to write quickly enough, write REFER TO AUDIO RECORDING on the interview form.

KEY INFORMANT INTERVIEW

Agribusiness Firm's code	Country	Date (dd/mm/yy)	Interview number

To be completed by the interviewer

1. Introduction: Corporate Information

This interview aims to identify the firm characteristics and institutional factors that influence matching grants choice, effects of matching grants to agribusiness firms' performance. It will focus on the current matching grant structure under operation by BioInnovate Africa Phase II grants.

READ THE INFORMED CONSENT FORM TO THE RESPONDENT(S) AND ASK THEM TO SIGN IT.

1.1 What is your Name? (WRITE THE RESPONSE BELOW)

1.2 What is your current position? (WRITE THE RESPONSE BELOW)

1.3 What is your current place of work? (WRITE THE RESPONSE BELOW)

1.4 Which of the following describes the ownership structure of your business? (WRITE THE RESPONSE BELOW)

1. Sole proprietor
2. Partnership
3. Limited Liability company
4. Corporation
5. Other (SPECIFY):

1.5 How long has this company been in operation? (WRITE THE RESPONSE BELOW)

2. Experience with matching grants

2.1 For how long have you served this organization? (WRITE THE RESPONSE BELOW)

2.2 Do you have any experience working with projects with Matching grants? (WRITE THE RESPONSE BELOW)

2.3 What was your experience like? (WRITE THE RESPONSE BELOW)

2.4 How did you cost the matching grant constituents below? (WRITE THE RESPONSE BELOW)

No.	**Matching grants constituents**	**Computation of the value**
1	Space (office)	
2	Land	
3	Staff	
4	Cash	
5	Machineries	
6	Training	
7	Overheads	
8	Others (ii)	
9	Others (iii)	

2.5 In your opinion do you think BioInnovate Africa is justified to include matching grants as a mandatory requirement for grants qualification? (WRITE THE RESPONSE BELOW)

Explain:

2.6 In your opinion, what could be the factors that could be considered for one requiring Matching grants in agribusiness? (WRITE THE RESPONSE BELOW)

2.7 What has been the firms practise for providing matching grants for innovation projects? (Beliefs and Norms)

2.8 Would you term these practices Good or bad?

2.9 Are there firm's guidelines that state the type of matching grants to provide?

Yes	
No	

2.10 If yes, what do they state? If no, go to No.2.13.

a. Policies and standards

b. Rules and regulations

2.11 How are they enforced/ implemented?

2.12 Would you term these guidelines Good or bad?

Reasons:

2.13 Do you think that institutions/ private sectors and NGOs should provide matching grants? (WRITE THE RESPONSE BELOW)

Reasons:

3. Constraint faced with matching grants

3.1 In your opinion what are the possible constraints that an agribusiness is likely to encounter while providing matching grants? (WRITE THE RESPONSE BELOW)

3.2 What are the possible ways of mitigating these constraints? (WRITE THE RESPONSE BELOW)

4. Opportunities of matching grants

4.1 What was your firm's performance (i) 2 years back/ before the project and (ii) currently?

	Performance	**Before project/ 2 years back**	**Current**

1	Sales volume (in dollars)		
2	Human capital (No of employees)		
3	Asset value (in dollars)		
4	Market shares (%)		
5	Gross profit margin (%)		

4.2 Would you associate the effects in (4.1) with the matching grant you provided?

Yes	
No	

4.3 Give reason for your answer in 4.2?

5. Recommendation on matching grants

5.1 Does your firm have an overhead policy? (TICK ONE ANSWER)

	Yes
	No

5.2 In your opinion do you think overhead costs can be used as matching grants. (TICK ONE ANSWER)

	1.Yes
	2.No

5.2.1 Explain your answer.

5.3 In your opinion what kind of agribusiness(es) innovation requires matching grants? (WRITE THE RESPONSE BELOW)

5.4 In developing a Matching grants model what are the key features you would recommend for inclusion in the model

Thank you!

Appendix 4: Questionnaire

ASSESSMENT OF A MATCHING GRANTS MODEL FOR FINANCING AGRIBUSINESS INNOVATION IN EASTERN AFRICA

Section A: Demographic of an organization

1. Name of the organization:

   ……

   ……

2. Year of establishment: Month ……Year …….

3. Country (tick one)

Country	Tick here	Country	Tick here
Kenya		Ethiopia	
Uganda		Rwanda	
Tanzania		Burundi	

4. What is your position in this organization?

   ……

5. Email address:

   ……..…..

6. Company physical address:

   ……

   ……

7. How many people are employed by your firm? (Tick where appropriate)

1	1-20 employees	
2	21-50 employees	
3	51-100 employees	
4	>100employees	

8. What is the business ownership structure of your firm? (Tick where appropriate)

Sole proprietor	
Corporation	
Limited Liability company	
Partnership	
Society/Group	
Others Specify……	

9. Which of the following characteristics best explains your firm? (Tick **ONE)**

A	**B**	**C**
-Decision making and power is concentrated at the top or head office. -High use of standardized procedures. -Mostly downward communication and very little upward communication. -The firm functions are grouped into departments.	-There is high participation in decision making by low-level staff. -There is comprehensive information network since communication flows up and down very freely. -Team works especially cross functional teams. - firms grouped in projects or tasks	-A combination of both functional and project authority that flows both down and across. -Each person working on the project has more than one boss; the project manager and functional manager -There is inter-disciplinary specialization. -Most of the authority is delegated to project managers

10. Which of the following assets does your firm own or lease? (For tangible assets indicate leased or owned)

Tangible Assets	**Indicate Lease or Own**	**Intangible assets**	**Tick the one applicable**
Land		Goodwill	
Machineries		Patents	
Vehicles		Brand	
Office space		Copyrights	
Training		Trademark	
Staff		Permit	
Others: specify		Corporate Intellectual Property	

Section B Company Products

11. What products does your company produce?
    i. …….
    ii. ……..
    iii. ……..
    iv. ……..
    v. ……
    vi. ……
    vii. …….
    viii. …….
    ix. ……
    x. ……
12. In the past 2 years has your company produced new or improved products?

    Yes No

13. If yes list them below:

    i. …….
    ii. ……..
    iii. ……..
    iv. ……..

14. What services does your firm provide?

    i. …….
    ii. ……..
    iii. ……..
    iv. ……..
    v. ……

15. In the past 2 years has your company produced new or improved service

    Yes No

16. If yes list them below

    i. …….
    ii. ……..
    iii. ……..
    iv. ……..

Section C: Grant details

17. Project title

    ……
    ……
    ……

18. What was your financial budget for the above project? (In Dollars)

    …….

19. How much grant did you receive from BioInnovate Africa or other funders? (In dollars)

    ……..

20. Why did your company apply for the grant?

……

……

……

……

21. Apart from the current project, do you have any other innovation projects running?

Yes No

22. If yes, how do you finance them?

……

……

……

23. What is your role in this project? (Tick where appropriate)

Marketing	
Selling	
Product development	
Advisory services	
Others specify: ……	

Section D: Financing Research and Innovation

24. Do you have a budget for research and innovation?

Yes No

25. If yes how much per year in dollars (tick Appropriately)

<10,0000	
10.001- 50,000	
50,001- 100,000	
100,001-250,000	
>250,000	

26. Apart from BioInnovate Africa funding the project and Matching grants, what other sources of finance are available for research and innovation in your company?
    a. ……..
    b. ……
    c. ……
    d. ……..

Section E: Matching Grant details

27. BioInnovate Africa required a 25% matching grant for a firm to qualify for Phase II grants. How much did you commit?

    ……..

28. Was the above (No. 25) in-kind or Cash? (Tick where appropriate)

In-kind	
Cash	
Both	

29. In your opinion, how would you rate the Matching grants required by BioInnovate Africa?

	1. High
	2. Moderate
	3. Low

30. Give reason for your answer in 29?

    ……
    ……
    ……
    ……

31. In your own opinion, why do you think the donors/ investors require beneficiaries to provide Matching grants?

    ……
    ……
    ……
    ……
    ……

32. Does the above reason(s) make sense?

    Yes No

33. In your opinion, what are the factors the donor should consider for the provision of Matching grants?

    ……
    ……
    ……
    ……
    ……

34. What did your organization provide as Matching grants? (%)

No.	**Type of Matching grants**	**Proportion to the total budget (%)**
1	Cash	
2	Office space	
3	Staff	

4	Training facilities	
5	Land	
6	Machineries	
7	Intellectual Property Rights	
8	Brand Name	
9	Overhead costs	
10	Others (specify)	
	Total %	

35. How do you determine the cost of matching grant in question 34?

……

……

……

……

……

36. Apart from the above constituents of matching grants, is there any other that you are aware of that is provided elsewhere?

Yes No

37. If yes, how is it computed?

……

……

…….

38. In providing the above Matching grants constituents, does your organization experience any challenges?

    Yes No

39. If yes, what challenges do your company experience?

    1.....

    2.....

    3.....

    4.....

    5.....

    6……

40. In your opinion does the current matching grant structure influence:

No.	Performance	YES	No
A	Sales volume of the business?		
B	Profitability of the business?		
C	Asset base of the business?		
D	Human Resources/ technical capacity of the business?		
E	Market share of the business?		

Thank you.

Appendix 5: NACOSTI research permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 310171

Date of Issue: 02/December/2020

RESEARCH LICENSE

This is to Certify that Ms.. Susan Akinyi Amukoa of International Centre of Insect Physiology and Ecology, has been licensed to conduct research in Kilifi, Kisumu, Nairobi on the topic: Assessment of Matching Grants Model for Financing Agribusiness Innovation In Eastern Africa for the period ending : 02/December/2021.

License No: NACOSTI/P/20/7255

310171

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

Appendix 6: A snapshot of the manuscript abstract

Journal of Innovation and Entrepreneurship

An Explorative Study of Agribusiness Managers' Perception of Matching Funds for Innovation Financing in Kenya.

--Manuscript Draft--

Manuscript Number:	JIAE-D-22-00146R2
Full Title:	An Explorative Study of Agribusiness Managers' Perception of Matching Funds for Innovation Financing in Kenya.
Article Type:	Research
Funding Information:	Agence Nationale de Recherches sur le Sida et les Hépatites Virales — Dr. Julius Ecuru
Abstract:	Agribusiness innovation is vital for economic growth and diversification. However, funds to support it are a major point of debate among innovation scholars and policy makers. Most investors and donors require agribusiness firms to provide matching funds contribution either in kind or cash to innovation projects they finance. In some of the innovation projects like in this study, agribusinesses partner with universities and research organizations in the framework of Public Private Partnership (PPP) to fund agribusiness innovation. This paper is based on an exploratory study conducted in 2021 to: 1) assess agribusiness managers' perception of matching grants; 2) develop a matching fund costing framework: 3) identify institutional factors that influence agribusiness firm's choice of matching fund; and 4) determine constraints experienced by agribusinesses while providing matching grants. Twelve (12) Kenyan-based agribusiness firms participated in the study. A thematic analysis was used to analyze qualitative data. The results showed that managers of agribusiness firms had a positive perception towards matching funds for financing innovation. Agribusiness managers believed that matching funds was a way to show their commitment to the project, promote ownership and accelerate adoption of project results. Firm policies and practices aided the decision on choice of matching funds. However, majority of agribusiness firms did not have policies to inform their decisions on matching funds contribution. Agribusiness firm managers majorly relied on the following cognitive factors developed overtime in choosing matching fund: future business opportunity, and project alignment to the firm's core business as the basis for their decision on matching funds. The constraints experienced, includes, bureaucracy in reporting matching fund, unclear contract documents, difficulty in quantifying in-kind matching fund and potential failure of innovated products in the market. The study established that matching funds contributions by agribusinesses can be improved by customizing matching funds per the firm's needs and structure, training of project accountants and finance managers on how to properly account for in-kind matching funds, and strengthening enforcement of matching funds requirement in the contract documents. The paper provides preliminary empirical evidence of the feasibility of implementing a matching funds scheme for agribusiness innovation financing in Kenya. Key words: agribusiness, financing, firms, innovation, matching funds, Kenya.
Corresponding Author:	Susan Akinyi Amukoa, M.D. Kenya Agricultural and Livestock Research Organization Sugar Research Institute Kisumu, KENYA
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