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Economic importance of goats and scaling up strategies of community-based breeding programmes for smallholder farmers in Malawi and Uganda

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List of abbreviations and acronyms

AGIN	African Goat Improvement Network
AHC	Annual Housing Costs
ALS	Asset Life Span
AV	Asset Value
BF	Benefit of Financing
BI	Benefit of Insurance
CAHWs	Community Animal Health Workers
CBBIs	Community Based Breeding Institutions
CBBP	Community-based Breeding Programme
CBIs	Community Based Institutions
EPA	Extension Planning Area
GA	Government Agencies
GLM	General Linear Model
GM	Gross Margins
GMI	Gross Margins with Intangible benefits
GR	Gross Revenue
GRI	Gross Revenue with Intangible benefits
ITBG	Intangible Benefit of Goats
MK	Malawi Kwacha
NGOs	Non-Governmental Organizations

NID	NGO and International Donors
NP	Net Profit
NPI	Net Profit with Intangible benefits
OCC	Opportunity Cost of Capital
RAAKS	Rapid Appraisal of Agricultural Knowledge System
RC	Return on Capital
RTI	Research and Training Institutions
SF	Smallholder goat farmers
SV	Salvage Value
TBG	Tangible Benefit of Goats
TLUs	Tropical Livestock Units
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VC	Variable Costs
VCA	Value Chain Actors
VSCS	Village Saving and Credit Schemes

Declaration

I hereby declare that I am the sole author of this work; no assistance other than that permitted has been used and all quotes and concepts taken from unpublished sources, published literature or the internet in wording or in basic content have been identified by footnotes or with precise source citations.

Signature:…..…….

Date:…..…….

Dedication

To my late grandmother, Phalyce Kachingwe and my son, Chimwemwe and daughter, Alinafe.

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First and foremost, I would like to thank God the Almighty for blessing me with this opportunity to study at BOKU-University of Natural Resources and Life Sciences and keeping me and my family healthy throughout the three-year study period at the University. Secondly, I would like to acknowledge my supervisory team: Dr. Maria Wurzinger, Professor. Dr. Johann Sölkner, Associate. Professor. Dr. Gábor Mészáros and Professor. Dr. Timothy Gondwe for their guidance from the planning, designing, execution and preparation of this thesis. It is because of their technical advice and professional corrections that this research has been conducted to successful completion.

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Abstract

Community-based breeding programmes (CBBPs) have emerged as a viable option to implement livestock breeding in smallholder production systems. CBBPs are more frequent with keepers of indigenous small ruminants in rural areas in developing countries. The objectives of this study were: 1) to determine socio-economic contributions of indigenous goats to smallholders' livelihoods in crop-livestock production systems where goat CBBPs are being implemented and 2) to explore and document scaling up and sustainability strategies for small ruminant CBBPs in smallholder production systems. A flock and household (137 households) monitoring study was conducted to determine socio-economic contributions of goats to smallholders' livelihoods in Malawi and scaling up and sustainability strategies were developed based on practical field experiences and lessons drawn from scaling up process of goat CBBPs implemented in Malawi and Uganda. Further insights were drawn from a review of multidisciplinary scaled-up pro-poor initiatives implemented in developing countries. The results showed that indigenous goat enterprises in smallholder farms are profitable and economically viable. The mean annual gross margin per flock and per goat was MK83,800 and MK14,600 (€1 = MK830.00), respectively. The average return on capital invested was 24.6%, exceeding the prevailing average commercial deposit rate (8%) by several folds. Inclusion of intangible benefits of goats significantly increased the mean annual net profit and the return on capital by 60.3% reflecting the importance of socio-economic roles goats play in providing current and future economic stability of rural households' economy. Therefore, financing and supporting scaling up of such programmes is a meaningful direct investment into the development of rural economy. The scaling up and sustainability strategies for CBBPs are discussed in the following topics: capacity of resource teams and user organizations, attributes of the technology/model, model awareness and demand, market-based strategies and product value chain, financing strategy, enabling environment and monitoring and evaluation. A systemic approach is

recommended when applying, testing and refining the strategies in practice. The long-term goal for the scaling up programme should be creation of a financially sustainable system in which smallholder farmers are able, on their own, to transact and sustain operations of their local breeding institutions using internally generated revenue.

Zusammenfassung

In den letzten Jahren konnte gezeigt werden, dass dörfliche Zuchtprogramme eine praktikable Option für die Einführung der Tierzucht in kleinbäuerlichen Produktionssystemen sind. Die Ziele der Studie: 1) Ermittlung des sozioökonomischen Beitrags einheimischer Ziegen zur Lebensgrundlage von Kleinbauern in Malawi und 2) Erarbeitung von Skalierungs- und Nachhaltigkeitsstrategien von dörflichen Zuchtprogrammen. Über einen Zeitraum von 12 Monaten wurden Daten zu Herdendynamik und Haushaltseinkommen erhoben. Zusäzlich wurden Skalierungs- und Nachhaltigkeitsstrategien entwickelt, die auf praktischen Felderfahrungen aus dem in Malawi und Uganda durchgeführten Prozess zur Umsetzung von dörflichen Zuchtprogrammen basierten. Die Ergebnisse zeigten, dass kleinbäuerliche Ziegenbetriebe rentabel und wirtschaftlich sind. Die mittlere jährliche Gewinnspanne je Herde und Ziege betrug 83.800 MK und 14.600 MK (1 € = 830,00 MK). Die durchschnittliche Kapitalrendite betrug 24,6% und übertraf den durchschnittlichen Einlagensatz (8%) um ein Vielfaches. Daher ist die Finanzierung und Unterstützung der Ausweitung solcher Programme eine bedeutende Direktinvestition in die Entwicklung der ländlichen Wirtschaft. Die Strategien zur Skalierung von Zuchtprogrammen umfassten: Kapazität von Ressourcenteams und Nutzerorganisationen, Attribute des Modells, Bekanntheit und Nachfrage, marktorientierte Strategien und Produktwertschöpfungskette, Finanzierungsstrategie, Ermöglichung des Umfelds sowie Kontrolle und Bewertung. Ein systemischer Ansatz wird empfohlen, wenn die Strategien in der Praxis angewendet, getestet und verfeinert werden. Langfristiges Ziel des Scaling-Up-Programms sollte die Schaffung eines finanziell tragfähigen Systems sein, in dem Kleinbauern mit selbst erwirtschafteten Einnahmen den Betrieb ihrer lokalen Zuchtinstitutionen aufrechterhalten können.

1 Introduction and research questions

Indigenous small ruminants (sheep and goats) have been part of rural livelihoods for millennia and have been instrumental in poverty reduction in resource poor communities in developing countries. They thrive in nearly all ecosystems, including harsh, frigid and arid zones and have developed certain valuable genetic traits such as ability to perform better under low input conditions, tolerant to diseases and parasites as well as heat stresses (Miller et al., 2012; Peacock, 2005). They require less space and feed compared to cattle hence they can be owned even by the landless (Kosgey and Okeyo, 2007). Small ruminants integrate very well into complex livelihood systems, and provide milk, meat, fiber, manure, cash, savings and status, and often have social and religious uses. They are climate change compliant and hence suitable for climate change resilient programmes.

Despite the valuable contributions of small ruminants to millions of resource-poor farmers, the sector has been given low research and development attention at national levels particularly in developing countries. Small ruminants have been overlooked in national agriculture development strategies (Miller et al., 2012) and prejudice towards other livestock species like cattle still exist (Mayberry et al., 2018). The contribution of small ruminants to the national economy is generally under-estimated because of the largely informal, mostly untaxed, nature of most markets for small ruminants and their products (Peacock, 2005). Few studies have addressed the technical and infrastructural issues pertaining to sustainable genetic improvement programmes for small ruminants in smallholder low input production systems (Kosgey and Okeyo, 2007). However, community-based breeding programmes (CBBPs) have recently emerged as a viable option to implement breeding programmes for indigenous small ruminants in low input smallholder production systems (Gutu et al., 2015; Haile et al., 2011; Kahi et al., 2005; Mueller et al., 2015; Peacock, 2008) The design of CBBPs helps smallholders to implement small ruminant breeding

programmes that are best suited to their local production environment and prevailing production systems. In many cases CBBPs combine genetic improvement strategies with improved husbandry practices (better nutrition, healthcare and housing). The core idea of the CBBPs is that farmers themselves are the owners of the breeding programme, therefore, their ideas, concepts and multipurpose objectives for rearing animals are reflected (Wurzinger and Gutierrez, 2017).

Positive performance and the accompanying challenges of a number of CBBPs implemented in different countries and regions have been reported (Gutu et al., 2015; Haile et al., 2011; Mueller et al., 2015; Peacock, 2008; Wurzinger et al. 2013). Many researchers concur that well organized and supported CBBPs have the potential of improving production and productivity of small ruminants and ultimately enhance smallholders' livelihoods. However, scaling up and sustainability strategies for CBBPs have not been clearly documented, applied, tested and refined in practice. The principles of scaling up and sustainability of pro-poor initiatives are deeply intertwined and feeds into each other (Brizzi and Mangiafico, 2015; UNDP, 2013). This study was aimed at developing strategies to optimize scaling up and sustainability of CBBPs in smallholder production systems, with the following specific objectives: 1) To determine socio-economic contributions of goats in crop-livestock smallholder production system to provide development agencies with the information which can form the basis for policy, technical and financial support for CBBPs in Malawi. 2) To explore and document scaling up and sustainability strategies for CBBPs in smallholder production system. The strategies were developed based on practical field experiences and lessons drawn from scaling up process of goat CBBPs carried out in Malawi and Uganda. Further insights were drawn from a review of multidisciplinary scaled-up pro-poor initiatives implemented in developing countries. The study was aimed at answering the following research questions:

1) What are the socio-economic contributions of indigenous goats to the livelihoods of smallholder farmers in Malawi?

2) What strategies can be employed to optimize scaling up and build sustainable community-based breeding programmes in smallholder livestock production systems?

1.1 Definitions and dimensions of scaling up

The World Health Organization (2010) defined scaling up as 'efforts to increase the impact of a technical solution successfully tested in pilot or experimental projects to benefit more people and to foster policy and programme development on a lasting basis'. This can be in form of expanding, replicating, adapting and sustaining successful policies, programmes, or projects in a geographic space and over time to reach a greater number of rural and urban poor (Fatunb et al., 2015). In covering a wider geographic area and number of people, Gündel et al. (2001) viewed scaling up as having two dimensions; horizontal and vertical. Franzel et al. (2004) defined horizontal scaling up as the spread of the successfully tested innovation across geographical areas to benefit more people; while vertical scaling up as being institutional in nature, involving different types of organizations with different functions from grassroot farmer groups to extension services, training and research institutions, policymakers, private companies and national and international organizations. In this thesis, the definition by Franzel et al. (2004) was adopted. For simplicity, the term 'scaling up' is used to refer to both horizontal and vertical scaling up. A specific term (horizontal scaling up or vertical scaling up) is used where special emphasis is needed. It must be noted however that horizontal and vertical scaling up often take place simultaneously. In practice, involving more beneficiaries is often associated with involving more organizations and broadening functional objectives. Hence success in scaling up rests on finding a good balance between horizontal and vertical approaches and a continuous evolution of the combination. (Ubels and Jacobs, 2016).

1.2 Thesis outline

The thesis is presented in five sections. Section one is the general introduction which highlights the importance of small ruminants, merits of community-based breeding programme as an alternative approach for improving indigenous small ruminants in smallholder system, rationale, objectives and research questions for the study and brief definitions and dimensions of the concept of scaling up. Section two presents literature review of socio-economic contribution of small ruminants in smallholder production systems, strengths and limitations of community-based breeding programmes, detailed review of the concept of scaling up and success factors for scaling up multidisciplinary pro-poor initiatives implemented in developing countries. Materials and methods and statistical data analyses are presented in section three. Section four presents study results of socio-economic contribution of indigenous goats in smallholder crop-livestock production systems in Malawi, experiences and lessons drawn from goat CBBP scaling up process implemented in Malawi and Uganda, and a discussion of scaling up and sustainability strategies of community-based breeding programmes in smallholder farms. Conclusions for the study are presented in section five.

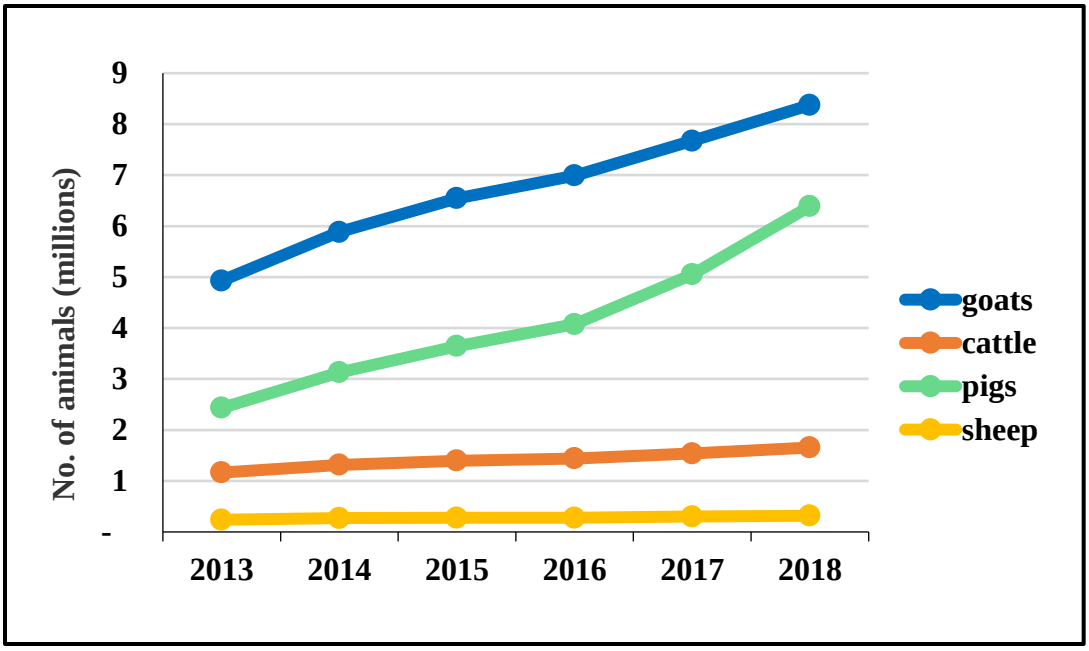
2 Literature review

2.1 Importance of small ruminants in smallholder production systems

In the low-rainfall areas of Africa and Asia, small ruminants represent the principal economic output, contributing a large share of the income of farmers (Salem and Smith, 2008). Millions of resource poor farmers keep small ruminants and often rely on these animals to provide multiple products and services. In harsh environments where crops do not do well, small ruminant rearing is often the main or only livelihood option available (Alary et al., 2011; Kosgey, 2004). During the last 15 years, the number of sheep has diminished at the world level, whereas the number of goats has strongly increased (Morand-Fehr and Boyazoglu, 1999) and overall, production of small ruminants (meat, milk and fiber) grew substantially in developing countries, but stagnated or decreased in industrialized countries. In Sub-Saharan Africa, small ruminant populations is projected to increase from 346 to 501 million and the carcass weight to increase from 12 to 17 kg/animal between the year, 2000 to 2030 (FAO, 2003). This will require more efficient animal production systems, careful management of natural resources and measures to reduce waste and environmental pollution (FAO, 2010b).

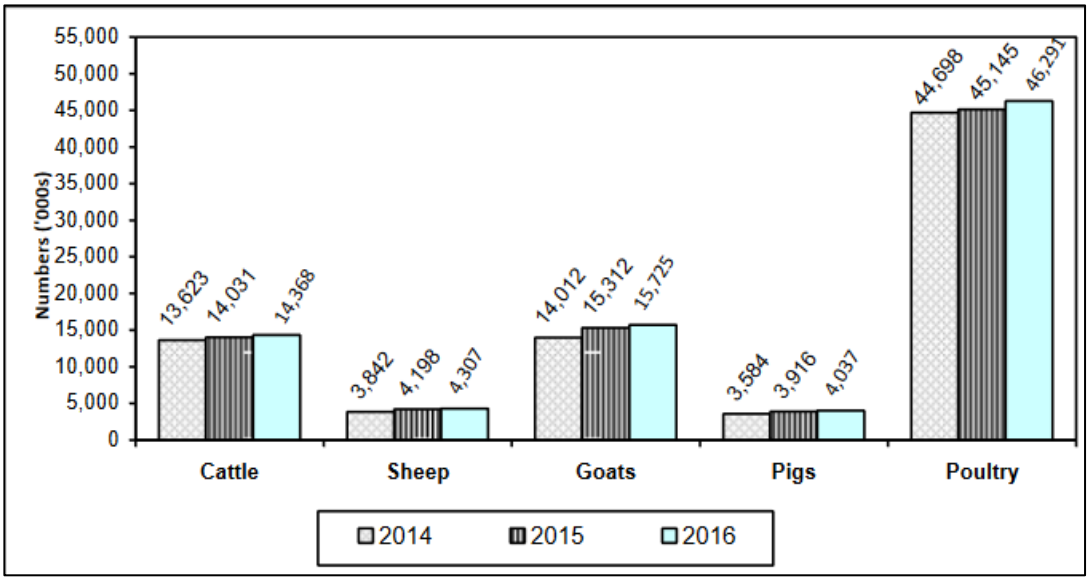
In Malawi and Uganda small ruminants play a significant role in enhancing income, food security and provide non-food products such as manure and skins (Banda et al., 2011; Byaruhanga et al., 2016; Maganga et al., 2015). They serve as a means of risk mitigation during crop failures, property security, monetary saving and investments, and have many other socio-economic and socio-cultural functions (Onzima et al., 2018). Over the past six years goat populations in the two countries have been growing steadily (Figures 1 and 2) and is currently estimated at 8.4 million in Malawi (Ministry of Agriculture Irrigation and Water Development, 2018) and 15.7 million in Uganda (Uganda

Bureau of Statistics, 2017). Although the numbers are different, there is similarities in terms of population growth trends of ruminants in the two countries.



Source: Ministry of Agriculture Irrigation and Water Development (2018)

Figure 1: Population growth trends for major livestock species (excluding poultry) in Malawi



Source: Uganda Bureau of Statistics (2017)

Figure 2: Population growth trends for major livestock species in Uganda

In Malawi the goat population is dominated by the Small East African local breed mainly raised for meat production while in Uganda the population is dominated by three major local breeds namely; Small East African, constituting 83.3% of the total population and Mubende and Kigezi goats comprising 14.5% and 2.2% respectively (Onzima et al., 2018). The goats are mainly raised under sedentary/crop-livestock production system in Malawi and household flock size varies widely ranging from 2 – 80 goats depending on agro-ecological characteristics and land holding size. In Uganda, small ruminants are mainly raised under pastoral, agro-pastoral and sedentary production systems. Pastoral and agro-pastoral systems are common in arid and semi-arid areas characterized by erratic rainfall and long dry seasons with scanty shrubs, thorns, and other hardy plants; while sedentary system is prevalent in the medium to high potential areas characterized by good fertile soils and high rainfall amounts (FAO, 2010a; Onzima et al., 2018).

2.2 Small ruminants as a source of income and food and nutrition security

Smith et al. (2013) and Woldu et al. (2016) observed that households rarely slaughter goats for home consumption, however, cash income realized from sale of goats and goat products is used to purchase lower cost protein source foods (chickens and small fishes) and other foodstuffs to diversify diets. Goat milk is an important source of protein, and essential minerals and vitamins for many pastoral households (Woldu et al., 2016). These are clear indication that goat keeping is both a direct and indirect contributor to increased households' dietary diversity, hence household food and nutrition security.

Small ruminant products not only represent a source of high-quality food, but also a source of income for many small farms in developing countries. The income is essential for paying school fees, purchase of food, as well as agricultural inputs, such as seeds, fertilizers and pesticides

(Legesse et al., 2008). At farm level, cash can be generated regularly from direct sales of livestock products, such as meat, milk, fiber, skins and manure. Livestock also provide increased economic stability to the farm or household, acting as a cash buffer (small livestock) and as capital reserve (large animals), as well as a deterrent against inflation (Sansoucy, 1995). As an agricultural product with relatively high-income elasticity, livestock are an opportunity for rural households to participate and benefit from urban-based economic growth (FAO, 2016). In mixed-farming systems, livestock reduce the risks associated with crop production. They represent liquid assets that can be realized at any time, adding further stability to millions of rural households' economy.

Nutrient recycling is an essential component of any sustainable farming system. The integration of small ruminants and crops allows for efficient nutrient recycling (Gupta et al., 2012). Animals use the crop residues, such as cereal and legume straws etc. The manure produced are recycled directly as organic fertilizers to boost crop production. One kilogram of goat and sheep droppings contains 6.0 g N, 4.9 g P, 7.3 g K and 7.7g Ca and 6.7g N, 4.4g P, 7.3g K and 7.7g Ca, respectively (Gbenou et al., 2017). The chemical composition of manure varies, however, according to the animal species and nature of their diets.

2.3 Small ruminants as a tool for savings and investment

In rural areas of many developing countries financial services such as credit, banking and insurance are virtually non-existent. Alternatively, it is possible to store wealth in form of crop yields (cereal and legume grains) but rodents and other pests take a heavy toll (Moll, 2005). Furthermore, seasonal fluctuation of prices for crop products and inflation renders this method inefficient. Indigenous small ruminants act as low-cost and inflation-proof alternative source of storing wealth and future financing of households' needs (Kosgey et al., 2004; Moll, 2005). Raising animals has often been

found to be superior to saving money in a bank account, because net annual returns from livestock are higher than interest rates in the bank (Coppock et al., 2018; Kosgey et al., 2004). Thus, livestock play an important role as a means of saving and capital investment, and they often provide a substantially higher return than alternative investments (FAO, 2014; FAO, 2009). A combination of small and large livestock (chickens, goats, sheep cattle etc.) that can be sold to meet petty-cash requirements to cover seasonal consumption deficits or to finance larger expenditures represents a valuable asset for the smallholder rural farmers (Sansoucy, 1995).

2.4 Strengths and limitations of community-based breeding programmes

2.4.1 Merits of community-based livestock breeding approaches

The global population of small ruminants is concentrated in South Asia and Sub Saharan Africa (Mayberry et al., 2018) and majority are kept by resource poor households in rural areas. The shortcomings of improving production and productivity of these animals via governments' centralized top-down breeding approaches and unplanned crossbreeding of indigenous with exotic breeds, have been reported (Gutu et al., 2015; Kosgey, 2004; Wurzinger et al., 2011). There is now a broad consensus among researchers that well-supported community-based breeding approaches have potential of creating sustainable solutions for livestock improvement in smallholder low-input systems in developing countries (Kahi et al., 2005; Kosgey, 2004; Wurzinger et al., 2011). The potential for success and sustainability of community-based breeding approaches hinges on participatory nature of the programme where farmers as custodians of the livestock are regarded as core players and owners of the programme while scientists, researchers and development agencies take an advisory and supportive role (Wurzinger et al., 2011). No matter how much effort is put into financial and technological support, the eventual survival of livestock improvement programmes depend on whether farmers have understood the objectives of the programme and have pledged their

commitment to collaborate with researchers and development agencies in genetic improvement efforts (Kahi et al., 2005). However, participatory alone is not a prescription for success (Wurzinger et al., 2011), there are potential constraints that need to be adequately addressed before sustainability of such programmes is guaranteed. These are discussed in the following paragraphs.

2.4.2 Long-term nature of breeding programmes versus short-term technical support and donor funding

Lack of qualified manpower is one major constraint to sustainable genetic improvement programmes in smallholder production systems in developing countries (Kosgey and Okeyo, 2007) Few qualified animal breeders are available in developing countries (Cloete, 2012). Even where they exist, the poor farmers cannot afford to hire their services. Sometimes even government institutions may not be willing to hire and keep them for long enough to ensure consistency of breeding programmes (Cloete, 2012; Kosgey and Okeyo, 2007). Consequently, well-intended genetic improvement projects fail, especially when their management is left in the hands of less qualified personnel, and ill-prepared farmers. This is an important area where government (local or national) in collaboration with research and training institutions need to prioritize community-based breeding as a viable alternative for smallholder improvement and allocate qualified personnel in strategic positions on a long-term basis (Wurzinger et al., 2011). Genetic improvement programmes are long-term and require significant investments (Biscarini et al., 2015; Mueller et al., 2015). The long-term nature poses great challenges: donors shift priorities, political governments change and NGO and donor funding favor programmes which generate outputs within a short period (Hartmann and Linn, 2007). This has an implication on availability of long-term technical and financial support necessary to build sustainable breeding programmes and to maintain farmers' drive sufficiently long enough for the realization of genetic improvement benefits. The long-time horizon requires that genetic improvement programmes be designed with a systemic mindset and in such a way that they

are not affected by changes of political government ruling periods (Haile et al., 2011; Hartmann and Linn, 2007). Hence efforts to institutionalize community-based breeding approaches into government policy apparatus is indispensable. Policy consists of laws, treaties, regulations, statements, administrative actions and funding priorities (Ajayi et al., 2018). Change of political governments rarely affect policies that are beneficial to many people especially the poor majority. Development aid, through government or NGOs is usually aligned with existing government development agenda one of which could be improvement of small ruminants in smallholder production systems if such programmes are officially recognized by government policy apparatus. Improved husbandry practices (better nutrition, good animal healthcare, improved housing and better markets) should be encouraged at the onset of the breeding programme. It is important to realize that early and major productivity gains will come from improved husbandry practices and not from genetic improvement. These husbandry gains would be the incentives to sustain farmers' morale for participating in the programme (Kosgey and Okeyo, 2007)

2.4.3 Capacity of smallholders in rural areas and extension services

It is a very challenging task to implement viable livestock breeding programmes in environments characterized by prevalent illiteracy of farmers, poor infrastructure, low technical capacity and limited financial support (internal and external) and little cash available for farmers themselves (Wurzinger et al., 2008). Therefore, investments must be made to develop and strengthen the capacity of farmers, local technical staff, institutions and organizations that have key stakes in the support of breeding programmes. Many technical skills are required, including animal identification and performance recording, animal breeding and genetics, animal husbandry, animal health management, marketing, data collection, analysis, interpretation and feedback (Haile et al., 2011). Education institutions, such as universities and colleges have therefore an essential role to play in

providing appropriate trainings to different stakeholders in the small ruminant subsector. In additional to providing training, these institutions can serve as a platform for networking and help in raising awareness of the programme among wider stakeholder groups (FAO, 2010b). Reliable and long-term extension service is crucial for successful implementation of genetic improvement programmes. The interactions of extension agents with livestock keepers address many environmental, technical and socio-economic aspects of production, e.g. how to raise a cross-bred animal, the need for animal recording, and the potential benefits of using improved genetic material (FAO, 2010b; Miller et al., 2012).

Farmers also require entrepreneurial skills in order to optimize returns from engaging in small ruminant production and value chains. As markets become more sophisticated, consistent supply and quality assurance of small ruminant products helps to attract lucrative markets for better returns (Kosgey et al., 2004). Better planning and timing of sales to coincide with peak demand periods (e.g., festivities like Christmas and Idd ul Hajj), should be part of market education and should be facilitated. When properly empowered and fully engaged in small ruminant's value chain, smallholders can greatly benefit, and their breeding activities enhanced to the level of enterprise and sustainability (Heifer Project International, 2013; Kosgey and Okeyo, 2007).

2.5 Definitions, dimensions and drivers for scaling up

The IIRR (2000) defined scaling up as '*bringing more quality benefits to more people over a wider geographical area, more quickly, more equitably, and more lastingly*'; and the World Bank (2003) defined it as; '*expanding, adapting and sustaining successful policies, programmes or projects in different places and over time to reach a greater number of people*', while WHO (2010) provided the following definition; '*deliberate efforts to increase the impact of successfully tested pilot or*

experimental projects so as to benefit more people and to foster policy and programme development on a lasting basis'.

From these definitions, common elements and important aspects of scaling up can be drawn. The common elements include, moving from smaller to larger impacts and ensuring that the impacts are sustainable. The important aspects of scaling up include, ensuring equitable distribution of benefits (IIRR, 2000) and ensuring that the innovations/models are adaptable to diverse environments (World Bank, 2003). The World Health Organization (2009) emphasized that scaling up should be a well-planned process backed by evidence of effectiveness and feasibility from successful pilots, and by including the aspect of "fostering policy development", it suggests that scaling up needs to occur at multiple levels and involve multiple stakeholders and institutional capacity building (WHO, 2010). Overall, scaling up has been perceived as a process of transforming pilot projects which have been successful on small scale into national or regional level policy (Do, 2019).

There are two dimensions of scaling up; vertical and horizontal scaling up. Vertical scaling up refers to the policy, political, legal, regulatory, budgetary changes needed to institutionalize the innovation at the national or sub-national level whereas horizontal scaling up involves expansion or replication of the innovation/model in different geographic sites or extension to cover larger or different population groups (WHO, 2010). Vertical scaling is a critical necessity for realizing and sustaining horizontal impact numbers. However, finding a good balance between vertical and horizontal scaling up is essential (Ubels and Jacobs, 2016), hence effective and sustained cooperation between the private sector, the development sector, and government is paramount.

Scaling up is inherently a complex process and requires substantial investment of time, energy and resources. It is a dynamic process, requiring drivers (forces) to give it direction and propel it forward.

The drivers are the inherent attributes of the innovation/model that provide solutions to peoples' challenges thereby creating natural demand among the people, and the respected leader/champion to lead the scaling up process (Hartmann and Linn, 2007). All successful programmes that were expanded from small beginnings to large programmes were championed and led by charismatic leaders who were endowed with a vision, persistent efforts, and often well connected to major stakeholders, and gifted with leadership skills. Economic shocks, natural disasters and civil unrests are also important drivers for scaling up because they provide opportunities as old systems cease to function or as a crisis calls for rapid new solutions (Hartmann and Linn, 2008).

Scaling up also require spaces (right conditions) to grow. Such spaces can pre-exist, but more often they have to be created. The spaces include the following:

Financial/fiscal space: The fiscal space relates to the development of financing strategies for the scaling up process and building institutions, structures and capacity to ensure sustainability. The strategies may include but not limited to: mainstreaming innovation/model's activities into relevant government development programmes or to ensure more coordinated and efficient approaches by various donors, encouraging private sector participation by providing the right incentives for private sector investments and where possible, designing for combined financing by beneficiaries'/producers', development, public and private sectors (Brizzi and Mangiafico, 2015; Haile et al., 2019)

Institutional/organizational space: This involves identifying and/or creating organizations/institutions (including institutions for smallholders at local level) to facilitate scaling up efforts and sustain scaled programmes. Hence successful scaling up include developing and implementing strategies that help to build or strengthen organizational/institutional capacity to

effectively drive the scaling up mandate (WHO, 2010). High level institutions must be willing to undergo restructuring (where needed) necessary for them to manage large scale programmes. Setting up new institutions and bypassing existing institutions should be considered under exceptional circumstances, otherwise strengthening and using the existing ones should be encouraged (Ajayi et al., 2018). Establishing and strengthening functional community-based institutions helps and empowers smallholders to be effective in setting the agenda, mobilizing resources, attracting the private sector, exercising convening authority, creating consensus for change, influencing policy reforms and sustaining scaled programmes (Brizzi and Mangiafico, 2015).

Partnership space: Scaling up is a multi-stakeholder process and therefore, getting stakeholders' buy-in from the beginning is crucial for scaling up success (IFAD, 2015; USAID, 2014). Partners in scaling up should be aligned around the purpose they explicitly share. Such alignment will underpin and drive the partnering endeavor forward, create synergy and foster the emergence of collective action and commitment (PPPLab, 2018a). Partnership is needed not only to leverage financial resources but also to bring in context-specific and institutional capacity, influence and outreach. In this respect, partnering with government, the private and development sectors, academics and knowledge networks should be seen as a way of increasing opportunities for scaling up and building sustainable programmes (Brizzi and Mangiafico, 2015; PPPLab, 2018a)).

Political/policy space: Programmes that involves large numbers of beneficiaries and institutions is likely to catch the attention of politicians. Politicians want to be seen helping large numbers of people, so the more farmers or value chain actors who demand a certain policy, the better the chances of approval (Miller et al., 2012). Therefore, the political system needs to be engaged early-on in the

scaling up process. This requires advocacy and the legitimization of the programme and goes beyond simply informing decisionmakers about the benefits of the programme (Hartmann and Linn, 2008; Cooley and Kohl, 2006). It requires creating constituencies and mobilizing stakeholders who are willing to place the expanded programme on their political platforms (Ajayi et al., 2018). The policy framework needs to support scaling up or should be adjusted to support scaling up.

Cultural and gender space: Cultural acceptability and gender sensitivity are key for scaling up. For example, in some societies or among some ethnic groups drinking goat milk is a taboo, so it would be inappropriate to attempt a dairy goat project in such environments (Miller et al., 2012), hence identification of the potential cultural and gender obstacles is one of the prerequisites for model scaling up (IFAD, 2015). Possible cultural and gender barriers should be identified, and adaptations made to permit scaling up in a culturally diverse environments and eliminate gender disparities (USAID, 2014).

Learning space: Knowledge about what works and what does not work in scaling up needs to be created and managed through monitoring and evaluation (Do, 2019; Hartmann and Linn, 2008).

Natural resource/environmental space: The impacts of interventions on natural resources and the environment need to be considered in a way that negative impacts must be mitigated while positive impacts must be leveraged (Do, 2019).

2.6 Success factors for scaling up pro-poor initiatives in developing countries

The need for simple, suitable and adaptable innovations/models: Before embarking on scaling up an innovation, a comprehensive understanding is needed of the environmental, cultural, and

social context in which innovation or practices would be replicated (Millar and Connell, 2010). If innovations are easy to use, require low inputs, have low risk and high returns, are compatible with socio-cultural dimensions and existing resources, and have advantages over traditional practices, then scaling up is more likely to occur (Millar and Connell, 2010; Shilomboleni and De-Plaen, 2019).

Strengthening participatory processes: There is now a broad consensus in the scientific community that farmers' participation in designing and implementation of pro-poor initiatives is crucial for the adoption and sustainable ownership of the new innovations/models and ideas (Duguma, 2010; König et al., 2016; Mueller et al., 2015; Wurzinger et al., 2011). When researchers and extension workers are working towards scaling up useful innovations/practices, they need to have a sound understanding of participatory research processes including how farmers learn, how they experiment and innovate, and how local decisions are made in the family and social structures (Millar and Connell, 2010; Wurzinger et al., 2011). Smallholders should be truly engaged right from planning and throughout the research process and allow flexibility in project designs to facilitate participatory decision-making to respond more effectively to local demands and circumstances. The approach promotes inclusive learning and strengthen capacity development of smallholders which is instrumental for leveraging new opportunities and advocate for their needs and priorities more effectively (Millar and Connell, 2010; Shilomboleni and De-Plaen, 2019). This kind of engagement is emancipatory because it is based on mutual respect and trust between researchers and poor people whose indigenous knowledge is key for solving practical problems but often undervalued (Shilomboleni and De-Plaen, 2019).

Investment returns for smallholders; Resource-poor farmers cannot afford to invest time and effort without the surety for tangible benefits from the programme, which is key for stimulating the buy-in from the community, the government, and other stakeholders (Miller et al., 2012). According to Shilomboleni and De-Plaen (2019), profitability, which is the tangible economic benefits of a technology for end users, is an important factor that influences wide adoption and sustainability of an innovation. Millar and Connell (2010) found that where technologies have addressed genuine or immediate farmer problems/needs and concerns, uptake and adaptation of the technology has been greater than where benefits are more diffuse and long-term.

Peer to peer farmer learning: In many circumstances, producers/farmers will not immediately adopt a new practice simply because they have been made aware of its benefits. Only after they have seen the practice working for their fellow farmers and what needs to be done in order to use the new practice in local conditions has been established, will the farmers be able to translate the idea into action, leading to adoption and ownership (Matras et al., 2013). Millar and Connell (2010) noted that farmer to farmer cross visits were a powerful way to stimulate interest in forage technology adoption as well as peer learning about livestock management. Selection of farmers who are active and good communicators while allowing for gender balance is essential for ensuring balanced information dissemination to all gender categories.

3 Materials and methods

3.1 Socio-economic contributions of indigenous goats to smallholders' livelihoods

3.1.1 Description and characteristics of study areas

In the framework of Feed the Future Initiative funded by United States Agency for International Development (USAID) and led by United States Department of Agriculture (USDA) in collaboration with the African Goat Improvement Network (AGIN), goat CBBPs were introduced

in Zombwe, Mitundu and Magote extension planning areas (EPAs) representing Mzimba, Lilongwe and Nsanje districts, respectively (Figure 3).

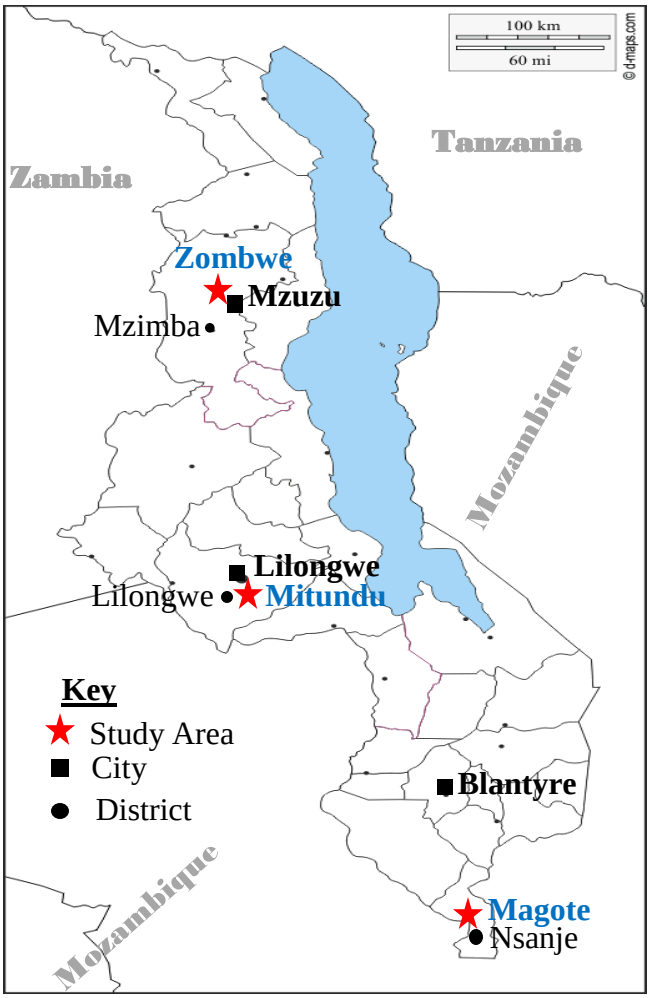


Figure 3: Map of Malawi showing study areas

Zombwe is located 25km north of Mzuzu city while Mitundu is located 35km south-west of Lilongwe city and Magote is 120km south of Blantyre city. For Zombwe and Magote the goat CBBP project commenced in 2014 while in Mitundu activity implementation for the project started in 2016. The overall goal of the project is to improve production and productivity of indigenous goats through selective breeding along with improved husbandry practices. In each EPA, two sites composing of an average of 8 villages per site formed a project impact area. In all these areas goats are raised under sedentary production system with mean household flock size of 12 goats. They are

managed under extensive management system where they roam freely during the dry season (June to November) after crop harvest and are tethered or grazed in communal grazing areas during crop growing rainy seasons (December to May). In all the study areas the goats kept are mostly of the small East African breed, raised, mainly for meat production. Nsanje lies at an altitude of 70 meters above sea level and is characterized by erratic rains with mean annual rainfall of 700 mm and mean temperatures of 32 and 25 in dry and rainy seasons respectively. Intermittent floods and droughts are common in the district. The climatic conditions and soil type are not favourable for arable farming hence livestock rearing is the major source of livelihoods. Sorghum and cotton are the main food and cash crops respectively. Goats are the second most important livestock specie after chickens and offtake rates are generally high (Nandolo et al., 2016). Lilongwe and Mzimba lie at an altitude of 1,050m and 1,254m respectively and receive medium to high rainfall ranging from 1000 mm to 1200 mm per annum. The agro-ecological conditions (soils and climate) for the two districts are favorable for arable farming hence tobacco and soy bean are the main cash crops while maize and groundnuts are used as both cash and food crops. Goats and chickens dominate in most households and are kept for multi-purpose reasons.

3.1.2 Evaluation framework

In the conventional analysis of benefits that accrue to farmers from goat improvement programmes in smallholder production systems, meat, milk and cash realized from sale of milk, live animals and other products are usually regarded as the only outputs from such programmes. This approach is inadequate because these products alone do not constitute the benefits of goat production in smallholder subsistence farming systems (Bosman, 1995; Ouma et al., 2004; Drucker and Anderson, 2004). The non-market functions of livestock are often ignored since they are difficult to value, yet they contribute to a better understanding of existing livestock production systems and producers'

decisions (Ouma et al., 2004). Unlike market-oriented commercial farmers, subsistence livestock producers follow broad production objectives that are driven more by their immediate household needs rather than demands of the market (Ayalew et al., 2003), therefore the conventional approach of evaluating subsistence livestock production based only on the common marketable outputs is inadequate (Moll, 2005). Therefore, this study was designed to perform a conventional economic analysis of indigenous goats in low input smallholder production systems including the appraisal of costs and benefits of smallholder subsistence livestock production systems first introduced by Bosman (1995) and implemented by Ayalew (2000) and Moll (2005). For analytical purposes, the benefits that farmers get from goats are categorized into two attributes: tangible benefits of goats (TBG) and intangible benefits of goats (IBG). The TBG include cash, meat, milk and manure; and the IBG include; goats playing roles as credit buffer and as insurance (security) for the producers during emergencies.

3.1.3 Sampling, data collection and analysis

A total of 137 goat farmers (Zombwe 42, Mitundu 46 and Magote 49) were randomly selected from the list of goat CBBP project beneficiaries from the three project impact areas. A household and flock monitoring study was conducted and data was collected from each household at an interval of four weeks for a period of 12 months (from August 2017 to July 2018). A semi-structured questionnaire was used to capture data which included: goat flock dynamics, demographic and socio-economic parameters, including household size, gender and education level of household head, livestock holdings, income generated, and costs incurred by the major agricultural enterprises (livestock and crops), number and type of livestock slaughtered for sale and for consumption and amount of home produced, sold and consumed crops.

3.1.3.1 Tangible benefits of goats (TBG)

The tangible benefits of goats included cash revenues realized from sell of live goats, goat meat and the estimated value of manure. Information on livestock revenue included the number of animals sold and the prices at which the animals were sold and the total revenue realized every time throughout the study period. The value of manure was estimated by using the average daily dry matter faecal output of an adult local goat and the average nitrogen and phosphorus contents of the goats' faecal dry matter reported by Osuhor et al. (2002). Local goats feeding on natural pastures with a supplementation of maize bran and cotton seed cake produces faecal dry matter which contains 2.8% nitrogen, 0.42% phosphorus and 0.93% potassium. An adult goat grazing for an average of 8 hours per day produces, on average, 0.36 kg of faecal dry matter every overnight confinement (Osuhor et al., 2002). This translate into 131 kg faecal dry matter per year which would contain 3.67 kg nitrogen, 0.55 kg phosphorus and 1.22 kg potassium. The unit price of nitrogen and phosphorus was derived from the average price of NPK and UREA commercial fertilizers during the study period. NPK contains, on average 23% of nitrogen and 21% of phosphorus, i.e. 44% of soluble nutrients. This, at the commercial rate of NPK (MK21,000 / 50kg bag; €1 = MK830.00 and MK = Malawi Kwacha) during the study period, gives an average price of MK954.55 per kg of soluble nutrients. Similarly, UREA contains 46% soluble nitrogen, which at the price of UREA (MK19,500 / 50kg bag) during the same period gives a unit nutrient price of MK847.83 per kg of nitrogen. An average of MK901.20 per kg of soluble nutrients was used because farmers in the study areas usually purchase both inorganic fertilizers. This rate was applied to estimate the equivalent value of manure from goats.

The value of milk was excluded from the analysis because indigenous goats are traditionally not milked in most parts of Malawi including the study areas. The major costs for goat production in

the three study areas included: veterinary costs, purchase of supplementary feeds, purchase of replacement stock (transfers-in) and construction of simple standard goat houses. Veterinary expenses comprised costs of dewormings and disease treatments. Only costs for supplementary feeds were captured because in crop-livestock mixed farming systems, goats are usually tethered during crop growing seasons and are left to graze freely on natural pastures and crop residues after crop harvest, making it difficult to attach economic value of feeds and estimate labor costs (Banda et al., 2011). The cost of simple standard goat house was estimated based on the average cost of construction materials (wooden poles, wire nails and thatch grass) and labor charges. The annual housing cost was estimated using a straight-line depreciation method given by the formula below: The simple standard goat houses are usually due for maintenance after a period of three years.

$$\mathbf{AHC = (AV - SV)/ALS} \qquad (1)$$

..where, AHC was the annual housing cost, AV was the asset value (goat standard house or kraal) estimated from the average cost of construction materials and labour charge, SV was the salvage value after the kraal's life span usually 20% of the kraal's initial value, and ALS was the asset life span, estimated at three years.

The return per Malawi Kwacha of capital tied up in the goat enterprise was calculated to assess whether investment in goat production returned more than the opportunity cost of capital. Capital was calculated by multiplying the annualized mean flock size by the average price of one goat during the study period. The annualized household flock size was the average between the initial and final mean flock size of the household over the observation period. The opportunity cost of capital was estimated using the formula below:

$$\mathbf{OCC} = \mathbf{b}_i\mathbf{X} \qquad (2)$$

where OCC was the opportunity cost of capital, **b*i*** was the average prevailing interest rate of deposits in commercial banks and **X** was the capital.

3.1.3.2 Intangible benefits of goats (IBG)

Goats as a credit buffer: Majority of the goat farmers in CBBP project sites live in areas where formal credits services are unavailable or if available, they are mostly informal and unaffordable because of high interest rates. So, goats act as low-cost and inflation-proof alternative source of financing of household needs. The attachment of monetary value to this socio-economic benefit arises on the notion that a household does not have to pay interest rate if it sells a goat to finance a need at hand but would have to pay an interest if an equivalent amount of money (from sale of goat) was borrowed from elsewhere (Ayalaw, 2003). So, the credit buffer or benefit of financing was calculated as follows:

$$\mathbf{BF} = \Sigma\mathbf{b}_f\mathbf{Y} \qquad (3)$$

where: **BF** was the benefit of financing or credit buffer; $\mathbf{b}_f$ was the prevailing local interest rate per annum; **Y** was the value of goats sold to finance a household's needs during the observation period. An average prevailing local interest rate (0.2) was used in this study. These are interest rates charged in village savings and credit (VSC) schemes, commonly called village banks; an arrangement where local farmers contribute money and lend the money to each other at an interest.

Goats as an insurance (security) cover: The insurance function of goats arises from goats having the potential of being sold during emergencies. Therefore, having goats is thus comparable with having insurance, and the absence of the need to pay a premium is what considered as benefit of

insurance. Rather than being calculated upon selling or slaughtering of the goats as in benefits of financing, benefits of insurance is calculated from the value of the animals that are available. Therefore, benefit of insurance is estimated by assuming that the whole flock is available to provide household security/insurance through liquidation at any one time when the need or an emergency arises (Bosman, 1995). It was quantified as a product of the insurance factor (estimated from the opportunity cost of insurance) and the monetary value of the annualized household flock and was calculated as follows:

$$\mathbf{BI = b_i X} \qquad (4)$$

where: **BI** was the benefit of insurance during the observation period; $\mathbf{b_i}$ was the insurance factor and **X** was the value of the annualized household flock during the observation period. The size of $\mathbf{b_i}$ was determined based on existing alternative insurance systems. Guesstimates criteria based on climatic conditions as suggested by (Moll, 2005) were implemented. Considering the instability of the climatic conditions of the study areas, the insurance factors of 0.1 was assigned for Nsanje District and an insurance factors of 0.075 for Lilongwe and Mzimba districts (Nsanje is more prone to droughts and floods than Lilongwe and Mzimba).

Gross margins (GM), net profit (NP) and returns on capital (RC) were used as economic indicators of success for the goat enterprises and were calculated as follows:

$$\mathbf{GM = GR - VC} \qquad (5)$$

$$\mathbf{GMI = GRI - VC} \qquad (6)$$

$$\mathbf{NP = GR - (VC + AHC + OCC)} \qquad (7)$$

$$\mathbf{NPI = GRI - (VC + AHC + OCC)} \qquad (8)$$

$$\mathbf{RC = NP/X} \qquad (9)$$

..where GR was the gross revenue, VC were the variable costs (replacement, veterinary, feed and other costs), GMI was the gross margins with intangible benefits, GRI was the gross revenue with intangible benefits. The other terms are as defined in the above formulae.

3.1.4 Statistical data analysis

Enterprise budgeting and cost-return analysis were used for short-term financial analysis for the goat enterprises in the study areas. Descriptive statistics were used for the analysis of continuous and categorical variables to summarize the demographic and socio-economic characteristics of households and flock ownership. The general linear model (GLM) of SAS 9.4 (SAS Institute Inc, 2012) was used to test the differences for significance at 5% level for average prices, number of animals sold and mean flock sizes for study areas and in different seasons. The following model was used.

$$\mathbf{Y_{ijk}} = \mu + \boldsymbol{\alpha_i} + \boldsymbol{\beta_j} + \mathbf{E_{ijk}}; \qquad (10)$$

where $\mathbf{Y_{ijk}}$ = the observation on average prices, number of animals sold and mean flock sizes; $\boldsymbol{\mu}$ = overall mean; $\boldsymbol{\alpha_i}$ = effect of the i^{th} study area (i = 1,.,3); $\boldsymbol{\beta}_j$ = effect of j^{th} season (j=1, 2); $\mathbf{E_{ijk}}$ = residual error. The interaction between site and season was not significant for the parameters under study hence was removed from the model.

3.2 Scaling up process for goat CBBP in Malawi and Uganda

The introduction of goat CBBPs in Malawi and Uganda led to the establishment of three pilot CBBP sites in Malawi and two sites in Uganda, hence increasing the number of CBBP sites and number of participating farmers was the first target. The CBBP model was subjected to a three-step Scaling Scan (PPPLab, 2018b), a practical tool to determine scalability of innovations/models. Step one involved construction of the scaling up targets (Figure 4) followed by a system and responsibility

check. The system and responsibility check is an analysis of the potential changes that could be brought by scaling up the model which might have positive or negative implications on society and the environment. Step two involved analysis of the attributes of the model and the external factors that determine the potential for scalability of the model. Step three involved analysis of key potential challenges which could negatively affect realization of the scaling up targets.

The results of the Scaling Scan and the nature of the goat CBBP (livestock breeding programme) indicated that the CBBP model could potentially be scaled by integrating the model into similar programmes and projects run by other organizations. This necessitated identification and establishment of partnerships with relevant stakeholders in the small ruminant subsector for the goat CBBP scaling up process in the two countries.

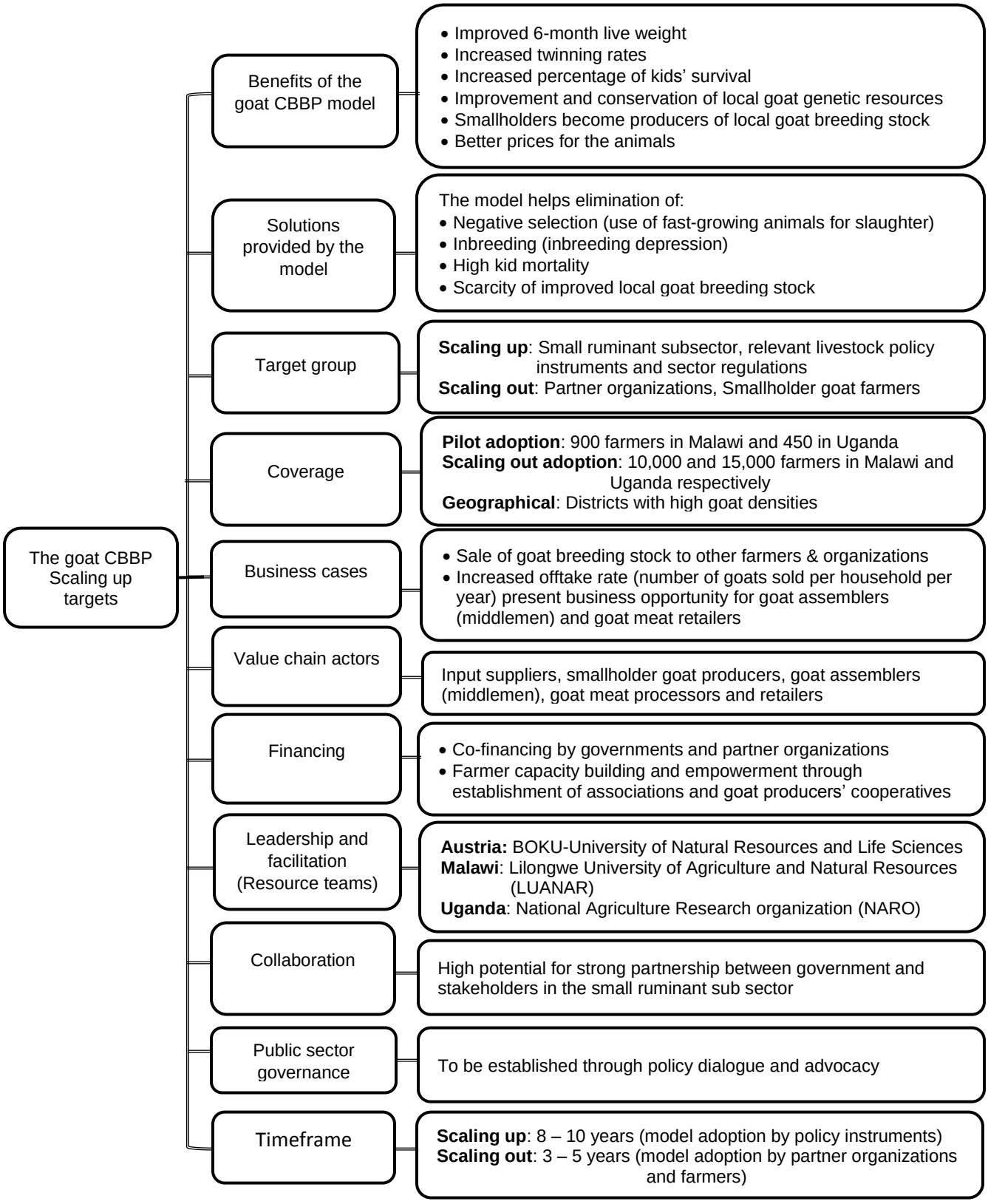


Figure 4: The goat CBBP scaling up targets

3.2.1 Stakeholders identification and engagement in Malawi and Uganda

Parameters used for stakeholders' identification and analysis (Actor identification, actor potential, actor analysis and strategic commitment-action planning) from the Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) analytical tool (Salomon and Engel, 1997) were used for identification of relevant and key stakeholders for the goat CBBP scaling up process. The processes were facilitated by the CBBP resource teams in both countries. The resource teams were composed of pilot project members and other co-opted individuals (from relevant institutions) facilitating implementation of pilot goat CBBPs in the two countries. In Malawi the work was done from July to September 2017 and in Uganda it was done from February to April 2018. The work involved series of resource team meetings for execution of the Scaling Scan and the RAAKS analytical tools, consultations with government livestock research and extension agencies and stakeholder workshops. The resource team meetings and consultations were conducted to identify, select and rank potential stakeholders. A stakeholder ranking matrix, suggested by Morris and Baddache (2012) was adapted and used to rank the stakeholders. The stakeholders were ranked on a subjective, but relative ordinal scale of 0 – 3 (a score of 3 being highly significant and a score of 0 being insignificant), for contributing to the following important parameters for scaling up goat CBBP: relevance, expertise, sustainability, resource mobilization, coordination/collaboration and influence. A description of the parameters is provided in Table 1. The scoring process was done by assessing stakeholders' potential for contributing to a specific parameter in relation to scaling up goat CBBPs. The assessment was done through a debate and consensus for joint ranking, conducted by the resource teams. The non-parametric Wilcoxon-Test of SAS (SAS Institute Inc, 2012) was performed for pairwise comparisons of stakeholders and to determine significant differences with regard to potential contributions for parameters instrumental for goat CBBP scaling up.

Table 1: Description of parameters used to rank CBBP potential stakeholders/partner organizations

Parameter	Description
Relevance	• Relevance of stakeholder/partner organization to goat CBBP e.g. involvement of indigenous goat production in their programmes/projects for livelihoods improvement of smallholder farmers
Expertise	• Availability of personnel with skills and technical expertise instrumental for implementing goat CBBPs
Sustainability	• Potential of the partner organization to support and or implement CBBP and empower target communities for sustainability of the programme
Resource mobilization	• Capacity of the partner organization to mobilize financial and materials resources to support CBBPs
Coordination and collaboration	• Capacity of the partner organization to coordinate scaling up/out activities and collaborate with other partners.
Influence	• Potential for the partner organization to positively influence other organizations for action in CBBP scaling up/out process.

The stakeholder selection and ranking were followed by stakeholder mapping and engagement. The stakeholder mapping involved personal interviews with representatives of the selected stakeholders to identify specific goat production/research related projects/programmes and understand their goals and objectives. The interviews also assessed availability of personnel, level of influence and their perspectives concerning CBPPs and development of stakeholder management strategies. Stakeholder consultative workshops were then conducted to facilitate stakeholder engagement and action planning. The workshops were designed to achieve the following: 1) bring awareness of the potentials of CBBP, its achievements following previous and current implementation. 2) jointly

determine how CBBP can fit into the stakeholders' existing rural livelihoods improvement programmes. 3) collectively identify specific potential sites for scaling up the programme, and 4) jointly evaluate and improve the goat CBBP scaling up targets which details: the solutions provided by the CBBP model, the target groups, scaling up coverage, the model's business cases, product value chain actors, method of financing, collaboration and feasible scaling up timeframe. The workshops also provided a platform to get feedback from the partner organizations on the best approaches for scaling up the programme, earmark areas of possible improvements and participatory analysis of potential challenges associated with the scaling up process and development of possible solutions. During the workshops, stakeholders broke into groups for an in-depth discussion on these issues and this was followed by group presentations and plenary discussion. The stakeholder consultative workshops were followed by special follow-up meetings to get and consolidate specific action plans for integrating the goat CBBP into the identified projects and programmes from the stakeholders who expressed commitment to support and take up implementation of goat CBBPs. Interviews with smallholder goat farmers were conducted in selected potential sites identified by stakeholders during the workshops. The interviews were designed to assess farmer's perceptions and willingness for participation in the programme and to understand a number of demographic, technical, socio-economic and socio-cultural, environmental and production system parameters. Although this was not the main focus of the study, the information obtained was instrumental in adapting CBBP implementation to suit the prevailing production systems and situations existing in different areas in the two countries.

4 Results and Discussion

4.1 Socio-economic contributions of goats in smallholder crop-livestock production system

4.1.1 Demographic characteristics of households keeping goats and flock dynamics

Majority (78%) of the households were male-headed, and the average age of household head was 46.5 years. The average family size was 5.8 persons per household, composed of approximately equal numbers of males (2.8) and females (3.0). The literacy rate among the household heads showed that 77% had a formal education up to primary school level, with an average of 6.3 years of formal schooling. Table 2 provide a summary of goat flock dynamics for the observation period. The mean flock size per household were significantly different ($P < 0.05$) in the three CBBP sites. Magote had the highest mean and the lowest mean was observed in Mitundu. Average flock composition percentages were 37.8, 5.1, 27.4 and 29.7 for does, bucks, weaners and kids, respectively. Births contributed the highest proportion (74.2%) of the total inflow for flock increase. Transfers-in which mainly constitute goats purchased for stock replacement and those received as gifts only accounted for 25.8%. Overall mean kidding rate (kids born as a percentage of breeding females in the flock) was 102.6%, with the highest and lowest percentages reported in Magote and Zombwe respectively. Sales of live goats constituted the highest percentage (55.0%) of the total stock outflow and 79.2% of the total offtake rate (proportion of animals sold, slaughtered and given away per household per year). Higher numbers of slaughters were observed in Zombwe than in Mitundu and Magote. Deaths accounted for 17.4% of the total outflow, with the highest kid mortality rate observed in Magote (25.8%) and Mitundu (16.8%)

Table 2: Goat dynamics per flock over the observation period in CBBP sites

Descriptors	CBBP site						Overall	P-value
	Zombwe n=42		Mitundu n=47		Magote n=49			
	ls mean	se	ls mean	se	ls mean	se		
Initial mean flock	12.9[a]	0.87	6.0[b]	0.85	19.8[c]	0.92	12.9	<0.0001
Percentage of does	32.8		36.9		46.5		38.7	
Kidding rate (%)	90.3		100.9		116.5		102.6	
Increases								
Births	4.7[a]	0.10	2.2[b]	0.10	7.9[c]	0.11	4.9	<0.0001
Transfers-in	0.8		0.2		1.4		1.7	
Subtotal	**18.5**		**8.4**		**29.1**		**19.6**	
Decreases								
Sales	4.0[ab]	0.72	2.2[b]	0.74	5.5[a]	0.67	3.8	0.0049
Slaughters	1.4		0.4		0.4		0.7	
Losses*	0.2		0.4		1.9		0.9	
Transfers-out	0.3		0.1		0.4		0.3	
Deaths	0.7		0.6		2.3		1.2	
Adult mortality (%)	4.8		10.2		3.2		6.1	
Kids mortality (%)	8.2		16.8		25.8		16.9	
subtotal	**6.4**		**3.2**		**10.1**		**6.9**	
Final mean flock	12.0		5.2		19.0		11.8	
Annualized flock	12.5		5.6		19.4		12.5	
Sales offtake rate (%)	21.6		21.4		18.9		20.6	
Total offtake rate (%)	30.7		28.0		21.4		26.7	
Average price (MK)[1]	19,773[a]	739	17,661[ab]	831	15,752[b]	732	17,729	0.0007

[abc]Means with different superscripts within a row are statistically different at P < 0.05. *Losses included animals that went missing and those predated. [1]Malawi Kwacha (€1 = MK830.00)

The high proportion of does and kidding rate observed in Magote flocks agreed with the report by Nandolo et al. (2016) who noted that Magote and Zombwe farmers had different breeding objectives. Magoti farmers were very much interested in selling more animals to get more money hence they preferred animals that grow fast, and preferably with high twinning rates whereas farmers in Zombwe were interested in bigger animals that fetch high prices and provide more meat. The variation of mean flock size observed in the study areas reflected the relative importance of goats in relation to other agricultural enterprises in the respective areas. Livestock particularly ruminants is a major source of livelihoods in Magote probably due to agro-ecological conditions that are not favorable for crop production. The observed high sales of live goats across all the study areas suggest that goats are primarily kept for generation of income to meet household needs and other socio-economic obligations. Although Zombwe reported a relatively higher numbers of slaughters compared to Mitundu and Magote, households rarely slaughter goats for own home consumptions unless during socio-cultural events such as weddings, funerals and religious functions. Woldu et al. (2016) found that the highest benefit of goat rearing in Ethiopia was derived from sale of live goats. The high kid mortality observed in Magote could be related to poor management and disease control. Nandolo et al. (2016) observed a high goat mortality (35%) in Magote and attributed this to disease prevalence such as diarrhea, pneumonia and parasitic infestation. It was evident that the high pre-weaning mortalities was significantly contributing to economic loss. Economic efficiency of goat enterprises is influenced by the number of offspring produced and raised to point of sale (Husein et al., 2005) hence high mortalities of young animals severely affect the farmers' economic returns. Through household modelling, Mayberry et al. (2018) found that goat profitability in extensive system were increased through improved healthcare, but the biggest improvement in productivity and profitability occurred when improved healthcare was combined with better goat nutrition. Therefore, genetic improvement combined

with improved animal healthcare and better nutrition should simultaneously be implemented to reduce goat mortalities for increased offtake rates and the corresponding revenues.

4.1.2 Number of animals kept

Besides goats, local chickens were the most prevalent livestock specie followed by pigs and cattle. The average tropical livestock units (TLUs) owned per household was 5.3 (4.5, 3.3 and 8.0 for Zombwe Mitundu and Magote, respectively), of which goats accounted for the highest proportion (43.0%), followed by cattle (31.5%) and pigs (16.2%). Cattle contributed relatively more TLUs in Magote and Zombwe while pigs were more important in Mitundu accounting for more TLUs than any other livestock specie (Figure 5). Guinea fowls and ducks are also important livestock species particularly for Magote farmers.

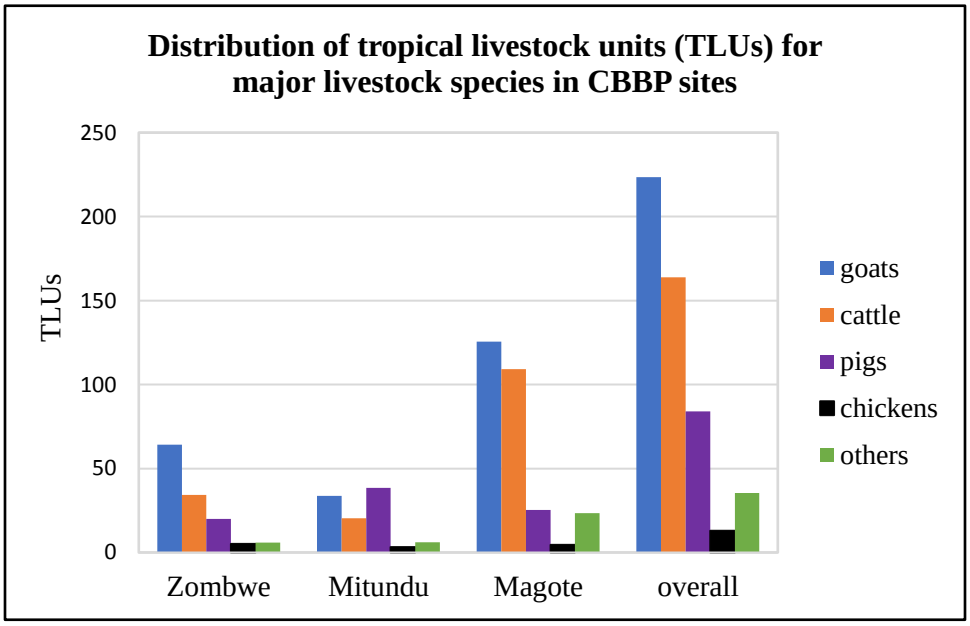


Figure 5: Distribution of TLUs for major livestock species in CBBP sites

The high proportion of TLUs contributed by goats in the study areas is an indication that goats are more important in these areas compared to other livestock species. Over the past 8 years indigenous goat population in Malawi have been increasing by an average of 12% while the percentage

increase for cattle has remained below 7% over the same period (Ministry of Agriculture Irrigation and Water Development, 2018). Miller et al. (2012) found that in the countries of the Southern African Development Community (SADC), cattle numbers have remained constant during the last 20 years, but goat numbers are steadily increasing because smallholders opt for small stock as land holding size reduces due to growing human population. Pigs and chickens are also widely kept by smallholders, but they are highly susceptible to African Swine Fever and Newcastle Disease, respectively. Therefore, keeping these species means taking high risks especially in smallholder production systems where livestock disease control is poor. Hence goats are usually preferred by resource poor households because they are disease resistant, adaptable to diverse environments and feed resources and the production costs are lower compared to cattle and pigs (Kosgey and Okeyo, 2007; Miller et al., 2012)

4.1.3 Overview of production costs and average farm gate prices of goats in study areas

Variable costs per flock in the three sites are presented in Table 3. The costs significantly differ ($P < 0.05$) in the three sites but non-significant differences were observed in different seasons. Significant differences of flock variable costs were due to differences in mean flock sizes. Animals purchased for stock replacement accounted for the highest proportion (88.2%) of the total variable costs. Average farm gate prices significantly differed ($P < 0.05$) between the three sites but non-significant differences were observed for the two seasons (Table 2). The prices were consistently high in Zombwe and low in Magote for the entire observation period. There was high price fluctuation during the first half of the observation period (August to February) in all the three study areas (Figure 6) after which the prices seemed to have stabilized.

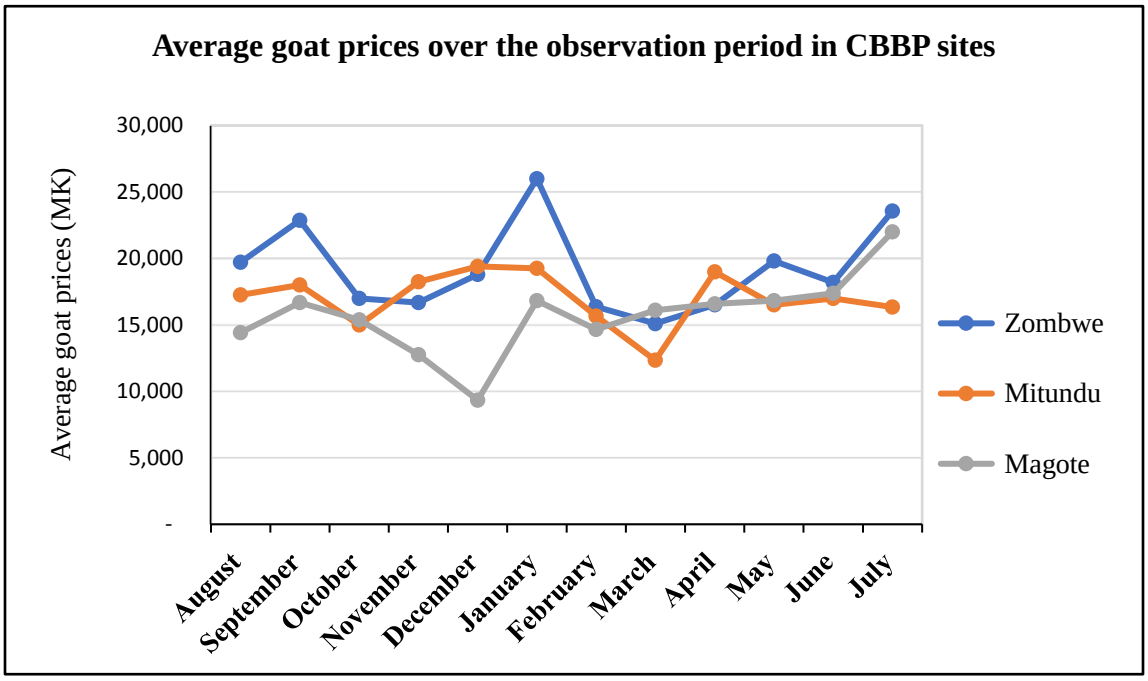


Figure 6: Average prices of goats in CBBP sites over the observation period

The observed average farm gate price in this study was within the range of those reported in similar studies (Maganga et al., 2015; Nandolo et al., 2016). The relatively higher prices observed in Zombwe could be attributed to several reasons. Sales records revealed that Zombwe farmers sold more breeding stock than any other site during the study period. This might have contributed to the observed high prices which ultimately translated into high mean net profit and return on capital observed in Zombwe flocks. Average prices for other livestock species (cattle, pigs and chickens) were also high in Zombwe and Mitundu and relatively low in Magote. This suggest that proximity to the cities might have a significant influence on average livestock prices in these areas. Analysis of the average age of goats sold, revealed that 58% of the total goats sold were young goats of less than one year. This explains the high fluctuation of the average price during the first half of the observation period. It was also noted that relatively higher numbers of goats were sold during the period (Figure 7A) when prices were fluctuating quite a lot. It was noted that when a relatively higher proportion of young goats were sold in a particular month, the average price falls. Similarly,

when a high proportion of adult goats (does and bucks) were sold the average price rose. More young goats were sold in Magote than any other site. Selling of young goats could be interpreted in two perspectives: Firstly, it could be a response to the urgent need for cash to solve some critical household needs and emergencies. This situation coupled with an ever-increasing demand for goats; (Banda et al., 2011; Kosgey and Okeyo, 2007; Maganga et al., 2015) forces farmers to sell more animals including young goats. Secondly, it could be a market strategy practiced by smallholder farmers to lower the production cost and to maintain the flock into manageable sizes. Woldu et al. (2016) observed that 54% of the goats sold in the highland crop-livestock farming systems of Ethiopia were young goats of less than one year and Al-Khaza'leh et al. (2015) also observed similar tendencies among Jordanian goat farmers. Bashir et al. (2018) found a mean flock size of 16 to 45 goats as optimal for increased net profit and observed a decreasing net profit and benefit-cost ratio with an increasing mean flock size due to inadequate nutrition and poor management practices by large goat keepers in India. So, selling of young goats could be marketing and management strategies practiced by smallholders for optimal profit. These observations suggest that low average prices observed among smallholder goat farmers should not always be interpreted as a result of exploitative behavior of middlemen. The low prices offered might be due to the fact that farmers were strategically selling young animals for reasons that best suit their current situation.

4.1.4 Number of goats sold, gross margins, net profit and returns on capital in CBBP sites

Significant differences ($P < 0.05$) were observed for the number of goats sold and the corresponding total gross revenue realized for the three sites and in different seasons. Magote farmers sold 53.7% of the total number of goats sold during the observation period while Zombwe and Mitundu farmers sold 31.2% and 15.1% respectively. A total of 98 selected breeding bucks were sold. Farmers from Zombwe sold 70.4% of the total number of the breeding bucks while

Magote farmers sold 29.6% and Mitundu did not sell any breed stock during the observation period. A significant number of goats were sold during the dry season (June to November) and the corresponding significant revenue was realized during the same period (Figure 7A and 7B). On average a household sold five goats during the dry season and three goats during the rainy season.

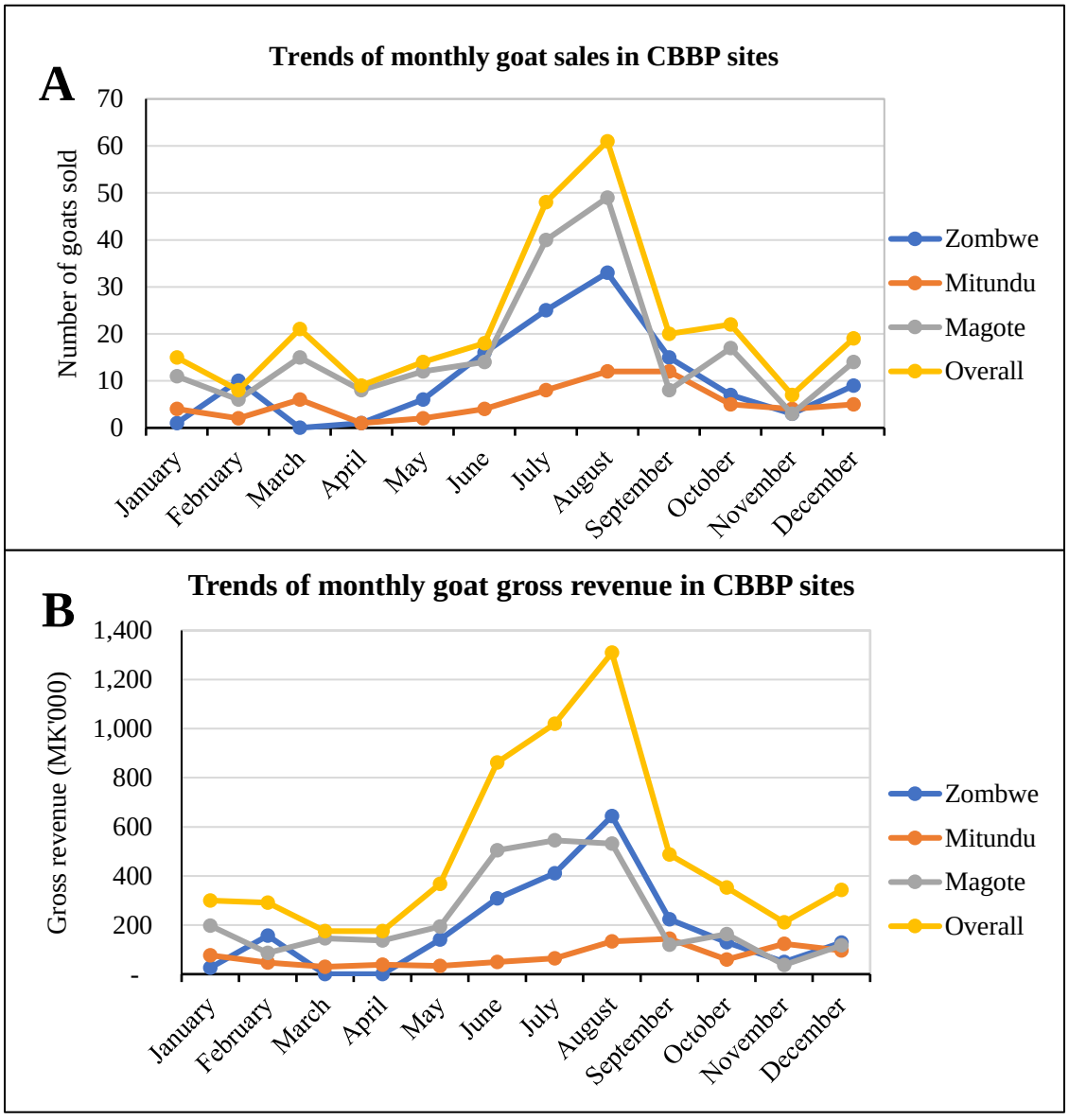


Figure 7A and 7B: Trend of monthly goat sales and the corresponding gross revenue in the CBBP sites

Several important agricultural activities coincide with this period which explain the increased sales of goats. Firstly, the period between April and August is the harvesting time for most of the field

crops in Malawi, hence goats have usually unlimited access to plenty of crop residues and natural pastures leading to improved body conditions. This makes it an optimal time for selling goats due to better prices (Banda et al., 2011) offered for more physically appealing goats. Secondly, crop harvesting period is an ideal time for restocking food reserves (particularly for Magote farmers) because during this period prices of crop produce are at the lowest level. Hence it makes sense to sell more livestock at relatively high prices and purchase crop produce which are selling at relatively low prices. Thirdly, this is a preparatory period for crop growing rainy season which usually commences in November each year, hence more goats are sold to finance purchase of agricultural inputs (particularly for Zombwe and Mitundu farmers). It was interesting to note that increased sales of other livestock species were also observed during the same period. This observation suggests that there is a strong synergy between crops and livestock, particularly goats toward enhancement of household income and food security. Civil Society Network on Climate Change (2014) found that goats are among the most equitably distributed livestock species among resource poor households and rank highest for increasing household income and resilience to climate related shocks. Gryseels (1988) found a positive correlation in smallholder farms between ownership of livestock and increased grain yields. These observations demonstrate that goats are instrumental in enhancing livelihoods of rural farmers. This is a solid base to justify increased development support of the small ruminant subsector regarding financial investments, establishment of institutional structures and creation of conducive policy environment for increased small ruminant production and productivity. A significant proportion (66.2%) of the total revenue from the tangible benefits of goats was generated through sales of live goats. Manure accounted for 15.7% while 13.6% of the revenue were generated through sales of goat meat and 4.5% constituted the value of goats given out as gifts.

Table 3: Goat revenues, gross margins (GM) net profit (NP) and return on capital (RC) per flock per year in Malawi Kwacha (MK) for tangible and intangible benefits of goats in study areas (€1 = MK830.00)

Parameter	Sites			Overall
	Zombwe	Mitundu	Magote	
Average capital (MK)	246,846	99,202	305,431	229,681
TBG[1] (MK)				
Live sales	79,092	31,790	86,636	65,839
Slaughters	27,089	7,594	5,828	13,504
Transfers-out	5,734	2,096	5,828	4,553
Manure	15,588	7,014	24,212	15,605
Subtotal	**127,504**	**48,494**	**122,504**	**99,501**
IBG[2] (MK)				
Benefit of financing	15,771	6,288	17,327	13,129
Benefit of insurance	18,457	7,359	30,543	18,786
Subtotal	**34,228**	**13,647**	**47,870**	**31,915**
Production Costs (MK)				
Total variable costs	17,638	6,014	23,512	15,722
Annual housing cost	12,000	12,000	12,000	12,000
Interest on capital (8%)[3]	19,748	7,936	24,435	18,374
GM (MK)				
per flock	**109,866**	**42,480**	**98,992**	**83,779**
per head	**16,657**	**15,092**	**11,984**	**14,578**
GM with IBG (MK)				
per flock	**144,094**	**56,127**	**146,861**	**115,694**
per head	**22,704**	**20,899**	**19,655**	**21,086**
NP (MK)				
per flock	**78,118**	**22,544**	**62,557**	**54,406**
per head	**13,802**	**9,593**	**10,025**	**11,140**
Return on capital (%)	31.6	22.7	20.5	24.6
NP with IBG (MK)				
per flock	**112,346**	**36,190**	**110,427**	**87,050**
per head	**17,095**	**12,416**	**25,777**	**17,824**
Return on capital (%)	45.5	36.5	36.2	39.0
Percentage increase of NP by adding IBG	**43.8**	**60.5**	**76.5**	**60.3**

[1]Tangible benefits of goats; [2]Intangible benefits of goats; [3]The opportunity cost of capital

The average annual gross margins per flock and per goat without intangible benefits of goats were estimated at MK83,800 and MK14,600 respectively. Zombwe realized the highest gross margins per flock and per goat while the lowest gross margins were registered in Mitundu. Net profits also followed a similar trend. The high gross margins and net profit observed in Zombwe is due to the high average price of animals in the area. Inclusion of the intangible benefits of goats increased the gross margins and net profit by an average of 60.3%. The percentage increase was higher (76.5%) in Magote than the other study areas. The high intangible benefit of goats observed in Magote is due to the relatively high mean flock size and the number of animals sold. The mean flock size and the number of animals sold are the two factors that determine the size of the benefit of insurance and benefit of financing, respectively. The net profit represents a return on capital of 24.6% for net profit without intangible benefits and 39.0% for net profit with intangible benefits; with both values exceeding the prevailing average commercial deposit rate (8%) by several fold. This indicates that goat production is profitable and economically viable. Maganga et al. (2015) and Woldu et al. (2016) reported high gross margins and net profits in smallholder goat production farms and attributed this to low cost of production of the goat enterprises. The increase of net profit and return on capital due to the inclusion of intangible benefits reflects the importance of socio-economic roles goats play among rural farmers. For example, it has been estimated that approximately 80 percent of the value of livestock in low-input production systems in developing countries can be attributed to non-market roles, while only 20 percent is attributable to direct production outputs (Merriman et al., 2016; Ouma et al., 2004). Kosgey et al. (2008) observed that regular cash income and an insurance against emergencies were the highest priorities among the reasons for keeping small ruminants in Kenya. Therefore, it is important to include intangible benefits of small ruminants in evaluations of smallholder livestock production systems since this will have a bearing on any policy related

interventions whose target is households that are wholly or partially dependent on the livestock economy.

4.1.5 Contribution of agriculture enterprises to the household economy

The annual contribution of agriculture enterprises to household income is presented in Figure 8.

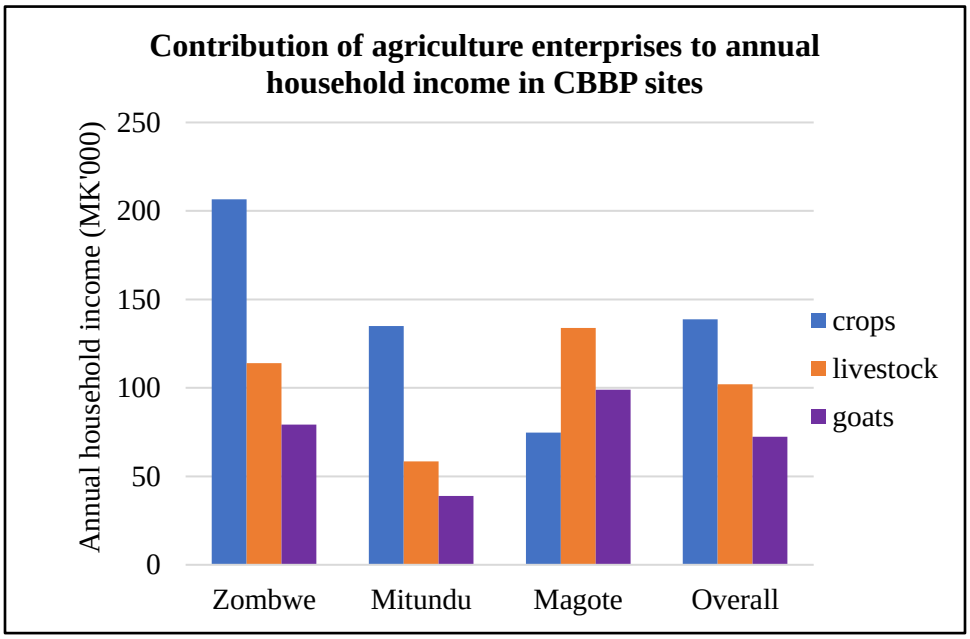


Figure 8: Contribution of agriculture enterprises to annual household income in the study areas sites

Goats contributed 27.6% of the total agriculture income while livestock (including goats) and crops contributed 46.8% and 53.2%, respectively. In Magote, the contribution of goats exceeded the contribution of crops which in principle means that livestock also exceeded crop contribution. Goats accounted for 61.2% of the total livestock income representing the biggest contributor (Figure 9), while cattle, pigs and chickens contributed 17.6%, 15.5% and 4.1% respectively.

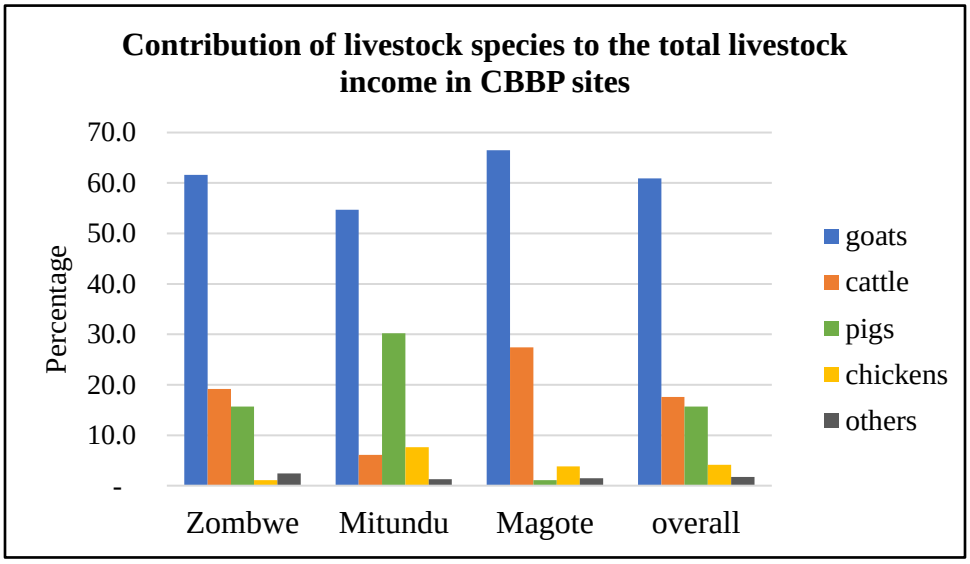


Figure 9: Contribution of livestock species to the total livestock income in the study areas sites

Magote farmers realized the highest income for both goats and cattle, while in Mitundu pigs and chickens had a significant contribution beside goats. The contribution of agricultural enterprises to household income observed in this study varied with the relative importance of the enterprise in respective areas. Sale of cash crops (tobacco and soy bean) contributed significantly to the total agriculture income in Zombwe and Mitundu reflecting the importance of these crops in these areas. Soil fertility, climatic conditions, crop performance, and land holding size usually determine the relative importance of different agriculture enterprises in different areas. The high contribution of livestock to the total agriculture income observed in Magote demonstrated that livestock is more important in Magote than crops. The high proportion of the total livestock income contributed by goats across all the study areas demonstrate the importance of goat production in these areas. Similar studies conducted in different regions (Kumar et al., 2010; Legesse et al., 2010; Metawi, 2016; Miller et al., 2012; Panin & Mahabile, 2002; Woldu et al., 2016) in developing countries also found that goat farming is profitable and contribute significantly to household economies of resource poor

farmers. This suggests that goats are an important source of income among rural farmers. Therefore, promoting and supporting goat-based interventions is an important investment to resource poor communities and have the potential to contribute meaningfully to reduction of rural poverty and hunger.

4.2 Scaling up goat CBBPs in Malawi and Uganda

4.2.1 Stakeholder characterization, selection and ranking

Figure 10 present types of stakeholders identified for goat CBBP scaling up process in Malawi and Uganda. The existence of stakeholders promoting and supporting indigenous goat production and research in small ruminant subsector in both Malawi and Uganda, offers an opportunity for different actors to work together by pooling financial resources and technical expertise for the establishment and sustainability of goat CBBPs

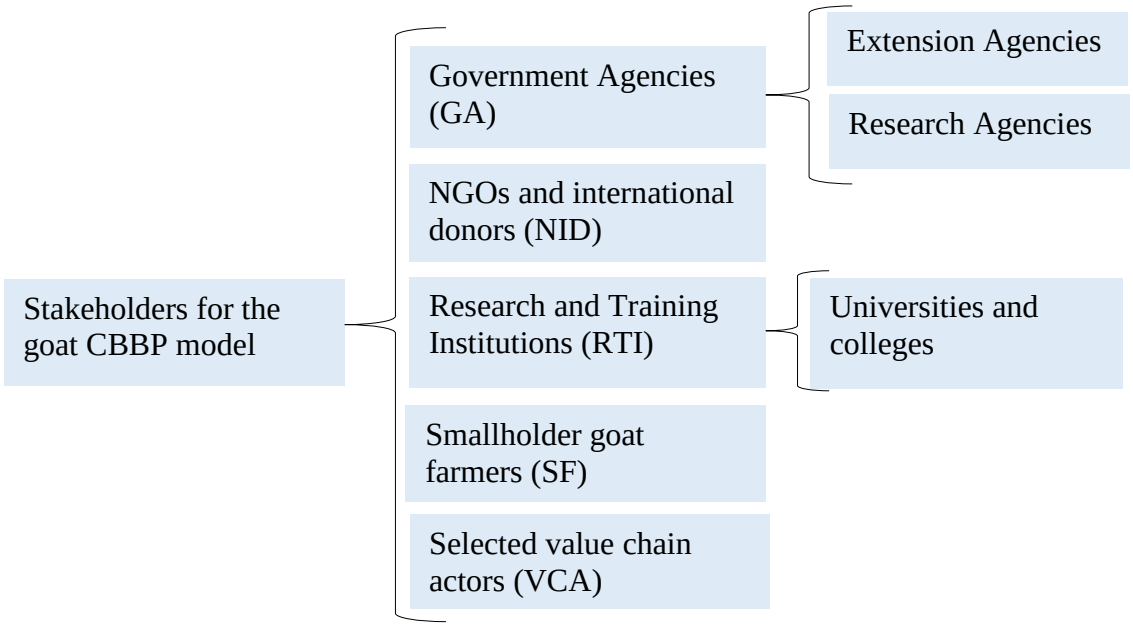


Figure 10: Stakeholders for scaling up the Community-based goat Breeding Programmes in Malawi and Uganda

It was noted during the scaling up process that there were numerous projects and programmes facilitated by various organizations (government agencies, NGOs, research and training institutions, international donors and faith-based organizations) with an overarching goal of enhancing smallholder livelihoods using goat-based interventions among other strategies. This presented an opportunity to bring the goat CBBP model to scale by integrating it into such programmes as a means of adding value to the programmes and spreading the benefits of CBBPs to more communities while spreading the cost of CBBPs to more organizations.

Results of pairwise comparisons of stakeholders on parameter scores used to rank stakeholders in Malawi and Uganda are given in Tables 4. Stakeholders were significantly different (Malawi $p < 0.0166$; Uganda $p < 0.0107$) with regard to potential for contribution to specific parameters important for goat CBBPs scaling up process. Government agencies and research and training institutions received the highest mean scores followed by smallholder farmers and NGOs and donors, reflecting the significant importance of these institutions for establishment and sustainability of goat CBBPs. Although there were minor variations for individual parameter scores between the two countries, the overall scores generally showed similar results for the two countries. Among other parameters, the capacity for coordination and potential to implement the goat CBBP model on a relatively larger scale were the determining factors in this choice. The ranking was instrumental for determining the level of attention during the engagement process and development of stakeholder management strategies to reinforce strong partnership

Table 4: Pairwise comparison of stakeholders on parameter scores instrumental for scaling up goat CBBP in Malawi and Uganda

Item	Malawi		Uganda	
	P-value	**Sign.**	**P-value**	**Sign.**
Global hypothesis (H0)	0.0166	*	0.0107	*
Pairwise comparisons				
GA[1] – NID[2]	0.0094	*	0.1131	n.s.
NID – RTI[3]	0.0157	*	0.0146	*
VCA[4] – RTI	0.0164	*	0.0023	*
GA – VCA	0.0164	*	0.0131	*
GA – SF[5]	0.2291	n.s.	0.2535	n.s.
RTI – SF	0.2291	n.s.	0.0325	*
NID – SF	0.2835	n.s.	0.8151	n.s.
VCA – SF	0.2156	n.s.	0.1938	n.s.
NID – VCA	0.5760	n.s.	0.1959	n.s.
GA – RTI	0.9520	n.s.	0.1482	n.s.

Mean scores

	GA	NID	VCA	RTI	SF
Malawi	2.92[a]	2.00[b]	1.50[b]	2.83[a]	2.25[ab]
Uganda	2.83[ac]	2.08[ab]	1.33[b]	3.00[c]	2.17[ab]

[1]Government Agencies; [2]NGOs and International Donors; [3]Research and Training Institutions; [4]Value Chain Actors; [5]Smallholder Farmers

*Significance at $p < 0.05$; n.s. = non-significance

[abc]Means with different superscripts within a row are significantly different at $p < 0.05$

Partnerships are an important strategy to bring innovations to scale, as they combine the competencies of different actors to address difficult development issues, create breakthroughs, and combine different types of financing to create and sustain solutions (Ubels and Jacobs, 2016). Partners for scaling up goat CBBP were selected to provide context-specific technical knowledge, influence and marketing-related needs. This was reinforced by bringing together partners which shared a common goal with the goat CBBP model (Table 5 and Figure 11). It was envisaged that such alignment will underpin and drive the partnering endeavor forward, create synergy and engagement, and foster the emergence of collective efforts (PPPLab , 2018a) The results were primarily visible during the stakeholder engagement workshops and follow-up action planning meetings.

Table 5: Stakeholders mapping and characterization in Malawi and Uganda

Name of Stakeholder	Stake in scaling up /out CBBPs	Why are they critical in scaling up/out CBBPs	Major development agenda (interests and objectives)	Stakeholder management Strategy (motivation to participate)	Responsibilities
Goat producers/ farmers	• Owners of Animal Genetic Resources (AnGRs)	• CBBPs not possible without them	• Improved livelihoods • Recognition of socio-economic and socio-cultural use of goats	• Clear benefits of CBBPs. • Capacity building. • Ownership. • Regular support	• Management of animals • Cooperate with scientists and facilitators • Management of farmer organizations (cooperatives and associations)
Government (Livestock research and Extension Support System)	• Livestock technology development • Provision of livestock extension services	• Programme implementation and institutionalization • Programme Sustainability	• Improved livelihoods of livestock farmers • Ensure a nation self-sufficient in safe animal products • Promotional of climate resilient animal production	• Clear benefits of CBBPs • Harmony with existing government policy/development agenda • Early programme involvement • Capacity building. • Conservation of AnGR	• Adopting and supporting scaling up/out CBBPs • CBBP integration into policy and programmes • Farmer capacity building
Research and Training institutions	• Data management and feedback • Capacity building	• Have necessary capacity for data management, analysis and feedback	• Capacity building • Livelihoods improvement through outreach and on-farm research	• Availability of researchable areas in CBBP • Availability of student research funds in the programme • Availability of conducive working environment for students	• Technology development for efficiency in product generation and marketing • Capacity building • Data management, analysis and feedback
NGOs/donors	• Provision of extension services, material and financial support	• Have the necessary capacity for resource mobilization	• Improved livelihoods of smallholder farmers	• Clear benefits of CBBPs • Harmony with their development agenda • Access and use of information generated from the programme	• Material and financial support • Linking farmers to potential markets • Provision of extension services
Private Sector (selected value chain actors)	• Provision of services • Potential market	• Provision of various services • Potential market	• Profit maximization	• Availability of attractive business cases in (CBBPs)	• Service provision • Provision of market for the products

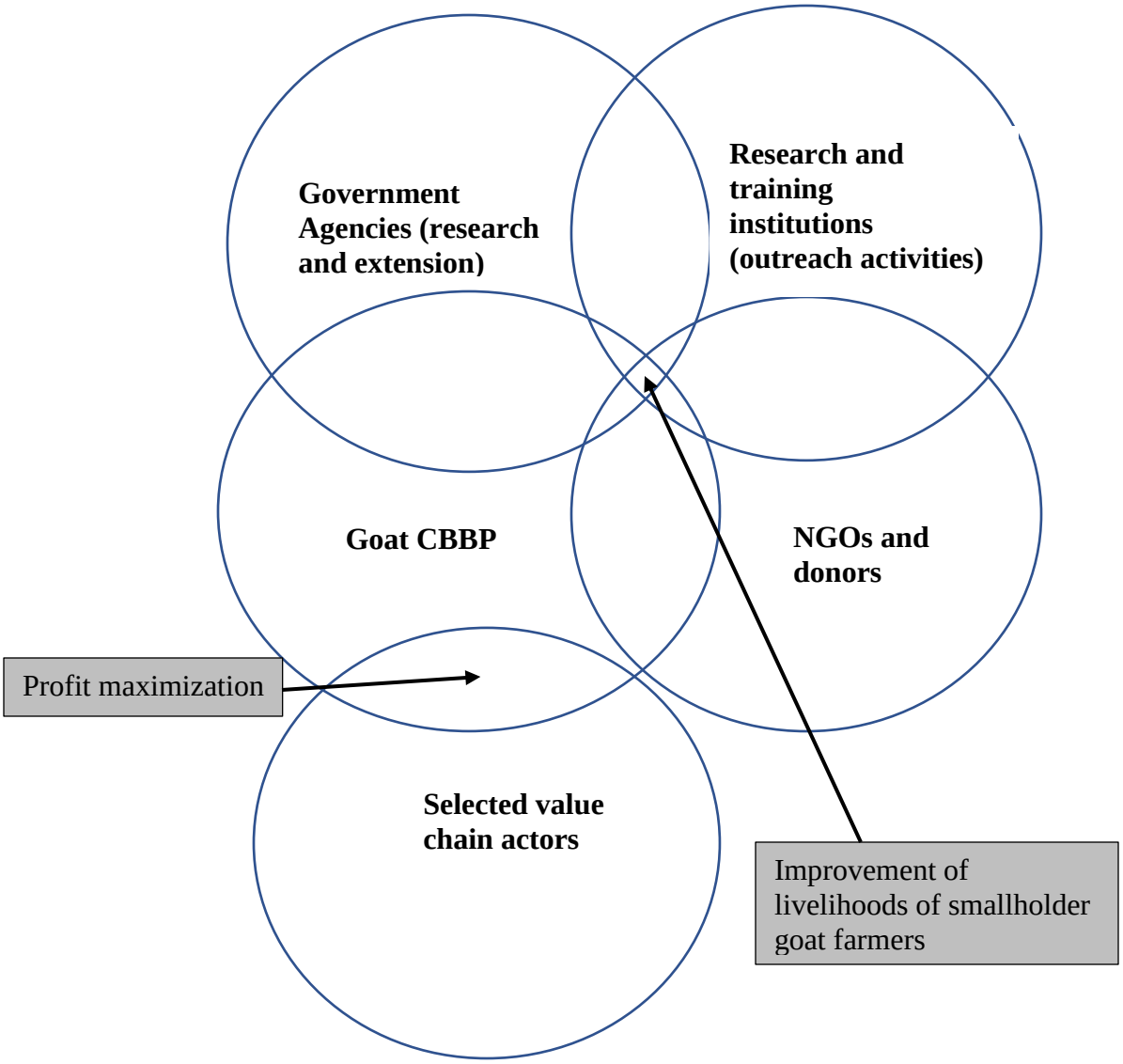


Figure 11: The common cross-cutting agenda for goat CBBP and collaborating partners

All stakeholders (government agencies, research and training institutions and development partners) in both countries acknowledged the need for collective and concerted efforts to pool financial resources and technical capacities for the improvement and conservation of the local goat genetic resources through goat CBBPs in the two countries and in Africa as a whole. This is because animal genetic diversity is critical for food security and rural development (Hoffmann, 2010). Therefore, given the potential for significant future changes brought by climate change in production conditions and in the objectives of livestock production, it is essential that the option value provided by the local

goat genetic diversity be secured. Stakeholders therefore reiterated the need for more awareness campaigns to create demand for the model and mobilize more partners to leverage financial resources and technical capacity for the scaling up effort.

4.2.2 Stakeholder engagement and action planning

In both countries the consultative workshops were attended by representatives of the following organizations: government agencies, research and training institutions, NGOs and international donors. Although the workshops were well patronized, the turn-up of stakeholders specifically from the NGOs sector, was below expectation relative to the list of invited potential organizations particularly in Malawi, purportedly due to unawareness of the existence of CBBP. Majority of the stakeholders did not know about CBBPs until during the stakeholder consultative workshops despite the programme being running for over three years. Hence participants advised that the present effort should have commenced right from the inception of the pilot projects which was not the case with the pilot goat CBBPs in both countries. In Ethiopia, Gutu et al. (2015) reported that there was very limited involvement of livestock extension during implementation of pilot sheep CBBPs especially at district level, resulting into less commitment in provision of technical support by the district level staff.

During the workshop in both countries, stakeholders recommended the establishment of a special CBBP taskforce to spearhead important tasks in the scaling up process and to act as a steering committee for the scaling up process. Some partner organizations were therefore nominated to be members of the taskforce to facilitate policy dialogue with relevant government agencies among other tasks. The nominations were conducted by members of the stakeholder workshop guided by the results of stakeholder characterization and ranking. Willingness to participate in the programme's

activities was among the criteria used for selection. For sustainability of CBBPs, the stakeholders recommended implementation of the following strategies: 1) integration of the CBBP model into government's small ruminant development programmes in the two countries; 2) capacity building and empowerment of the targeted beneficiaries along with establishment of community-based institutions (associations and cooperative); 3) establishment of a reliable and sustainable financing mechanism for the scaling up process and 4) continuous mobilization and engagement of new partners to leverage additional technical capacity and resources to further pursue the scaling up process, hence regular workshops should be an integral part of the process. Regular meetings will be an important monitoring and evaluation platform for reviewing implementation progress, share experiences, lessons, challenges, and possible solutions. February and September every year, were earmarked for annual review workshops for Uganda and Malawi respectively.

Several partner organizations committed to adopt the goat CBBP by integrating the CBBP model into their rural livelihood improvement programmes. They included CARITAS-Uganda, Iowa State University-Uganda Programme, and three climate resilient programmes funded by FAO-Uganda and implemented by Makerere University, the National Agriculture Research Organization (NARO) and the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). In Malawi two programmes (Sustainable Agricultural Promotion Programme (SAPP) and Malawi Drought Recovery and Resilient Programme (MDRRP)) coordinated by the Ministry of Agriculture were earmarked for integration of the CBBP model. Action plans detailing the integration processes were drawn. However, integrating the costs of CBBP with the budget of programmes that were under implementation was almost impossible. Even for programmes/projects that were at inception stage, budgetary harmonization was very challenging due to the fixed regulations that accompany most

donor funds and the long bureaucratic process involved for approval of budgetary revisions. The problem was exacerbated by personnel turnover (movement of personnel due to promotions, resignation and retirement) particularly in government agencies (Malawi case). In some cases, substantial time and resources (for travel and frequent meetings) were required to facilitate the process; and in other instances, the resource team was asked to submit concept notes to be assessed for funding (Uganda case). These experiences suggest that early (during pilot phase) engagement of dissemination partners and collaborative development of strategies for resource mobilization is key for subsequent smooth model rolling out. WHO (2011) noted that stakeholders who have been involved in pilot project implementation are more likely to support its scaling up than those who had little or no input.

4.3 Scaling up and sustainability strategies for CBBPs in smallholder production systems

The scaling up and sustainability strategies were developed based on the experiences and lessons drawn from the process of scaling up goat CBBPs in Malawi and Uganda described in the previous section. Further insights were drawn from a review of multidisciplinary scaled-up pro-poor initiatives implemented in developing countries.

4.3.1 Framework for setting up pilot CBBPs and programming for scaling up

The methodological framework for setting up pilot CBBPs and strategic planning for subsequent scaling up is summarized in Figure 12. The framework consists of four major components which include: 1) pilot implementation, consisting of CBBP pilot set up and learning and programming for scaling up, 2) preparations for rolling out involving activities to optimize the scaling up process, 3)

model rolling out involving implementation of the actual scaling up process which in this case should focus on learning and refining the scaling up strategies and 4) monitoring and evaluation as an important tool for guiding decisions making across the entire process. The following sections describe important elements in each component of the framework.

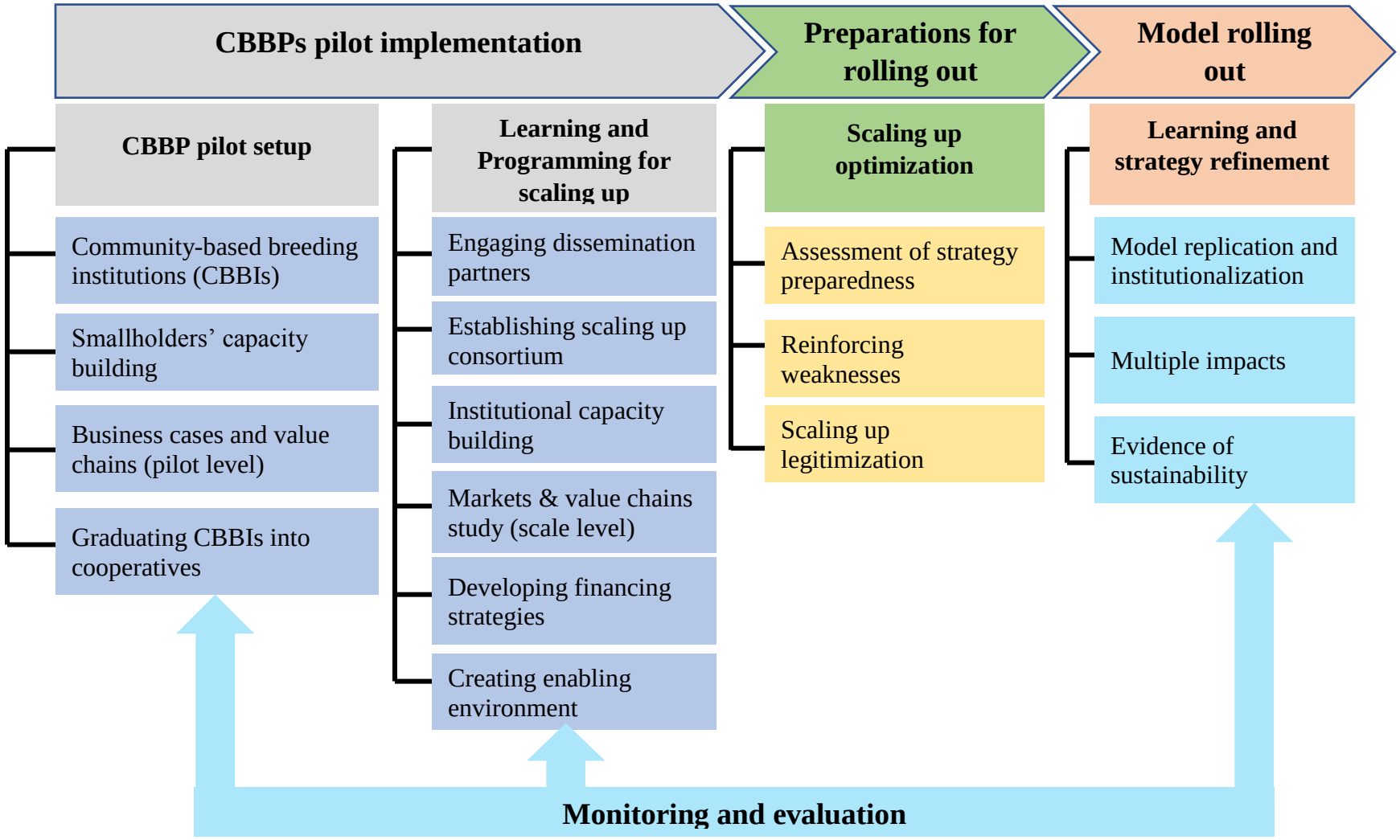


Figure 12: Framework for setting up pilot CBBP and programming for scaling up

4.3.2 Establishing scaling up targets

Scaling up goals and targets for successfully tested initiatives should be set based on practical realities in terms of available resources and potential constraints (WHO, 2010). For small ruminant CBBPs, the scaling up goals and targets should specify the geographical coverage (horizontal scaling up) of breeding activities indicating administrative/agro-ecological boundaries and estimated number of livestock and farmers to be involved (IFAD, 2015; PPPLab, 2017); and model institutionalization plan (vertical scaling up) specifying key stakeholders to be involved, relevant policies and small ruminant development programmes or relevant livestock development strategies. Establishment of scaling up targets is essential for determining the scope of the scaling up mandate and market and value chain study, number of dissemination partners to be involved and estimated amount of financial resources required. It is also important to note when estimating the timeframe that most meaningful scaling up processes take substantial time, starting from 5–7 years, but with 10–15 years as a more realistic timeframe (Hartmann and Linn, 2007) because much effort and time are needed to achieve governance, regulatory, institutional, legislative and budgetary changes (Miller et al., 2012; Ubels and Jacobs, 2016).

4.3.3 Community-based breeding institutions

Genetic improvement of livestock at village or community level, requires concerted effort and cooperation of all the concerned stakeholders. Majority of indigenous small ruminant genetic resources are kept by smallholders, making their involvement in improvement programmes essential (Kosgey and Okeyo, 2007; Wurzinger et al., 2011). Failure to engage smallholder farmers has been cited as one of the reasons why centralized breeding schemes implemented by governments in developing countries failed to bring sustainable solutions (Gutu et al., 2015; Kosgey et al., 2006;

Wurzinger et al., 2011). Researchers and development practitioners have now realized that the success of genetic improvement programmes in smallholder production systems will depend on whether the farmers, as custodians of the livestock, have understood the objectives of the programme and have pledged their commitment to cooperate with scientists, researchers and development practitioners in genetic improvement efforts.

The community-based breeding institutions (CBBIs) are here defined as organizations owned by farmers in a community with a common objective of improving livestock production and productivity using scientifically recommended principles. The community-based breeding institution forms the core management hub for breeding activities at village or community level, with support from experienced local research institutes, extension system, and development partners. The membership of the CBBI include participating farmers as core players and strategic members from local leadership, technical personnel at local level and representatives of development partners (government extension and research agencies, training and research institutions, NGOs etc.) working in the area (Kahi et al., 2005). Farmers are allowed to identify and select livestock traits that are more useful to their livelihoods and improvement of these traits forms the breeding objectives for the programme (Duguma, 2010; Haile, 2017). Achievement of these objectives is the core business of the CBBI. Among other functions, the development partners are responsible for building and strengthening capacity of the farmers and facilitating establishment of structures and local institutions for the creation of self-sustaining programmes. Depending on the size and scatter of the population to be covered, the CBBIs can be formed at district level or at more localized levels. The size and management structure of the CBBI are kept small and simple to allow effective interaction of participating farmers. Number of breeding females and the required number of improved sires are

estimated from the targeted population. The estimated potential output of improved breeding sires from the CBBI and the replacement frequency decide whether one CBBI is sufficient or more CBBIs are needed for the targeted population. Depending on the livestock population structure in terms of herd/flock sizes, collaborating scientists/researchers are responsible for coming up with better designs (1 tier or 2 tier scheme; open, closed and/or dispersed nuclei) taking into account issues of inbreeding and the costs of performance recording. The proposed designs are discussed with all the stakeholders (farmers, local extension staff and other development agencies) and an optimal design adopted based on the available potential markets for the product. Peacock (2008) and Kahi et al. (2005) have discussed detailed steps for setting up similar community-based breeding organizations and the breeding design options which can be considered based on population structure and resources available. Horizontal scaling up involves establishing more CBBIs in different areas. Over 60% of the costs in the current goat CBBPs in Malawi and Uganda are related to recording i.e. supplies of identification materials (ear tags) and payment of data collection enumerators. These costs are recurrent in nature, therefore, establishing more CBBIs means expanding recording activities, hence increasing the costs. However, a more cost-effective identification method like ear notching or tattooing (Neary and Yager, 2001; Swize, 2016) can be explored and if suitable and acceptable, be used to cut on the cost of recurrent purchase of ear tags. Use of local government personnel or 'lead farmers' for animal identification and performance recording should be explored. With appropriate training and incentives these can provide long-term services in the communities.

4.3.4 Scaling up strategies and development of sustainable breeding programme

Often, development practitioners focus only on a technical solution or a model that should be taken to scale. But in real life cases, what is scaled is not only a technical solution (Ubels and Jacobs, 2016; Wigboldus et al., 2016), but rather a set of organizational and transactional arrangements that stimulate, enable, and propel the adoption, use, management, and sustainability of the model. This means that scaling up a model or technical solution involves bringing to scale, key scaling up ingredients vital for the model to thrive. The scaling up ingredients include the following: capacity of resource team and user organizations, attributes of the technology/model, model awareness and demand, market-based strategies and product value chain, financing strategy, enabling environment and monitoring and evaluation (Ajayi et al., 2018; Hartmann and Linn, 2007; PPPLab, 2017; WHO, 2010). The scaling up ingredients essentially form the scaling up strategies. For best results, the scaling up strategies should be developed during inception of the pilot project (Wigboldus et al., 2016; Hartmann and Linn, 2007; Gündel et al., 2001) and continuously and collectively refined based on experiences and lessons learned throughout the pilot implementation process. Once this critical stage is overlooked scaling up is likely to face insurmountable challenges.

4.3.4.1 Capacity of resource team and user organizations

The resource team refers to the individuals and organizations that advocate and facilitate the adoption and wider use of the model while user organizations or dissemination partners refer to institutions/organizations and individuals that seek to or are expected to adopt and implement the model. The resource team typically includes key individuals and institutions that have been part of the development and testing of the model/technology. They have an in-depth understanding of the strengths and weaknesses of the model and the possible challenges associated with scaling up (WHO,

2010). Scaling up involves a range of intertwined processes operating in a diverse and dynamic environment (policies and politics, bureaucracy, limited resources, socio-economic and socio-cultural conditions, and people's expectations, needs, perspectives and rights) external to the resource team but with fundamental effects on the success of scaling up effort (PPPLab, 2018b; WHO, 2010). Hence a strong resource team with relevant technical, managerial, leadership, resource mobilization skills and sufficient time commitment is needed to drive the scaling up mandate. The following characteristics are essential for effective resource teams and user organizations (WHO, 2010):

- Members of the resource team must work with determination and unifying vision which should persuade the user organizations to see the need for adopting and implementing the model.
- Capacity for resource mobilization by resource team and user organizations is a critical factor for successful scaling up of CBBPs. Therefore, early engagement of dissemination partners and collaborative development of resource mobilization strategies is instrumental for successful scaling up and building of sustainable programmes.
- Resource teams should be able to assess the 'availability' and capacity of the user organizations for facilitating and supporting CBBPs and develop appropriate capacity development programmes to provide remedy for the existing gaps. Tailor-made training programmes should be developed and offered to different actors (Haile et al., 2011). For example, CBBPs as breeding programmes would inevitably require long-term technical support (livestock extension services, data management, evaluations and feedback etc.) from extension or research system. Relevant institutions with capacity to handle such tasks on a long-term basis, should be identified and a harmonious working partnership cultivated.

4.3.4.2 Attributes of the technology/model

The inherent attributes of the model or technology has been identified as one of the key factors for determining potential for scalability. For a model to be adjudged scalable, the following characteristics are essential (Millar and Connell, 2010; WHO, 2010).): The model must be credible based on sound evidence and/or advocated by respected persons or institutions. It must be testable, adaptable and observable so that dissemination partners can see the results in practice on a small-scale prior to large-scale adoption. The model must be relevant for addressing persistent or sharply felt problems and must be relatively advantageous over existing practices so that potential users are convinced and that the costs of implementation are motivated by the benefits. The model must be easy to install and understand rather than complex and complicated. The model must be compatible with the potential users' established values, norms, facilities and resources and must fit well into the prevailing regional or national development agendas. The resource team in collaboration with key user organizations should conduct a scaling up responsibility check (PPPLab, 2017), where potential for negative social and environmental implications, brought by model scaling up is evaluated. The following have been identified as essential attributes of the CBBP model which deemed it suitable for scaling up (Gutu et al., 2015; Haile et al., 2019; Haile, 2017): 1) improved small ruminant production and productivity (improved growth performance and yearling weight, improved twinning rates, reduced mortality rates), 2) better prices for the improved animals, 3) socio-economic empowerment of smallholders through training and establishment of functional cooperatives, 4) improved technical and institutional capacity of participating development and research agencies and 5) improvement and sustainable utilization of indigenous small ruminant genetic resources. These have helped to enhanced smallholder household income leading to improved food and nutrition security.

4.3.4.3 Creating model awareness and demand

Programme development and securing finances to support its implementation can be challenging and takes substantial effort and time. For practical planning purposes, it is essential to create awareness of the existence and possibly the performance of a model to key potential dissemination partners as early as possible. This necessitates that potential dissemination partners be sensitized, mobilized and engaged during pilot implementation (Gündel et al., 2001; Hartmann and Linn, 2007; Wigboldus et al., 2016). Dissemination partners who have been involved in the pilot are more likely to support its scaling up than those who had little input. Engaging future implementers and those who represent the beneficiaries is likely to produce interventions that are relevant, appropriate, feasible and sustainable (WHO, 2011). Early engagement helps dissemination partners to be conversant with the model's implementation requirements and to see the model's practical field performance in terms of generation of benefits and potential challenges. An assessment should however be conducted to determine the feasibility of engaging potential dissemination partners and policy makers during pilot implementation phase. Implementation of the pilot goat CBBP in Malawi and Uganda lacked this strategy, hence the scaling up process suffered sluggish progress as dissemination partners looked for evidence-based pilot results and more time and resources were required for collaborative programme planning and budgetary harmonization. Key strategies for creating awareness and demand for the CBBP model include but not limited to: organizing stakeholder workshops at pilot project/programme inception, inviting potential and key stakeholders to planning and progress evaluation meetings including buck/ram selection and animal show events, and establishing scaling up consortium/committee with key dissemination partners and collectively developing and refining scaling up strategies. Selected key private traders (small ruminant assemblers/brokers, butchers,

abattoir operators and meat/milk/fiber processors) or their representatives should be part and parcel of such events (Haile et al., 2011).

4.3.4.4 Market-based strategies and product value chains

Market-based approaches have gained ground particularly for market-driven initiatives because the private sector can have lasting impact through business cases and has operational scale (PPPLab, 2018b). Therefore, careful designing and testing of viable business cases during the model's pilot phase is an important tool for making the model attractive to the private sector as well as potential adopters during scaling up. It is important that before implementing any largescale small ruminant development programme in any country or region, a detailed market analysis of small ruminant products is undertaken including demand and supply, consumers' taste and preferences, export/import regulations, major market centers, price trends etc. (Heifer Project International, 2013). Whether the target is the vulnerable smallholder producers or small-medium enterprises, the most critical pre-project design step is the implementation of a value chain study. It is essential to realize that in the value chains of small ruminant products (live animals, meat, milk, skins, fiber etc.), smallholder producers are only a small entity of an integrated system of business actors. Therefore, designing interventions that bring meaningful and sustainable benefits to smallholders requires a holistic understanding of the opportunities and constraints at each node of the entire value chain. Appropriate interventions should then be designed to capitalize on the opportunities and address the constraints and weaknesses existing along the value chain. The information collected and analyzed through value chain study will play a critical role in preparing business plans at different levels, from input suppliers, goat producers, collectors/traders and processors (Legese and Fadiga, 2014). Heifer Project International (2013) has developed a useful goat value chain analysis toolkit, which can be applied

for analysis of value chains of products of other small ruminants. Information about implementation of small ruminant value chain studies to better design breeding programmes in previous and current small ruminant CBBPs is scanty.

High mortality rates have been reported as a major setback for small ruminant profitability in low input smallholder production systems in developing countries (Gutu et al., 2015; Husein et al., 2005; Mayberry et al., 2018). Therefore, when planning for scaling up, a reliable and functional healthcare system should be developed and operationazed at community level. Peacock (2008) discussed procedures for setting up an effective community-based animal health system in remote areas where government veterinary services are poor or none-existence. However, good animal healthcare alone is not a panacea for increased profitability. The biggest increases in small ruminant production, productivity and profitability are achieved when multiple interventions (genetic improvement, better nutrition, good animal healthcare, proper housing, better markets etc) are combined (Mayberry et al., 2018). It is also important to note that in breeding programmes early and major productivity gains will come from improved husbandry practices and not from genetic improvement (Haile et al., 2019; Kosgey and Okeyo, 2007). These husbandry gains are the incentives that drive early farmers' participation and commitment.

Market-based strategies also include strengthening the capacity of the beneficiaries and establishment of functional community-based institutions (CBIs). Community-based institutions (associations and cooperatives) are instrumental for empowering rural farmers to effectively participate in animal products value chains (Begovic et al., 2017; Miller et al., 2012). In developing countries, it is often very difficult for smallholders to engage in either new or existing value chains in a manner that will benefit them. Even if demand is high, such vulnerable farmers need first to have their capacity built in production, business skills and entrepreneurship to develop their activities to an enterprise level

that will equip them to engage in the value chain in a meaningful manner (Heifer Project International, 2013; IFAD, 2009; Vulnerability and Adaptability Programme, 2009). Those trusted with leadership of cooperatives and associations should undergo special leadership training including modules that help them to understand the value of integrity and trustworthiness in management of community resources and dedication and determination for achieving collective community aspirations. Well organized and functional community-based institutions that have aggregated to district or regional level can achieve economies of scale, easily acquire credits and inputs, consolidate their bargaining power for better prices, easily linked to lucrative markets, influence policies and even command international markets (Legese and Fadiga, 2014). Scaling up is a political process (Miller et al., 2012) and political support is necessary. Hence, organized groups of farmers or federations of cooperatives create "political capital" which gets the attention of politicians with the power to approve (Miller et al., 2012) policies and financial support for small ruminant development programmes. Special efforts should therefore be made to ensure that activities related to establishment and institutionalization of CBIs are implemented within the project's timeframe.

4.3.4.5 Financing strategy

Financing strategy is one of the critical factors that determine scaling up success and model sustainability. A clear understanding of the model's essential features, sustainability strategies and the estimated timeframe for attaining the development outputs and outcomes is crucial before a financing strategy can be developed (PPPLab, 2016). When planning for CBBP model scaling up, three important financing strategies should be considered: 1) strategies for financing the scaling up process, 2) an assessment and improvement of financial services to support vulnerable value chain actors and 3) a clear financial sustainability strategy after external support is withdrawn. Efforts

should be made as early as possible to secure medium- or long-term financial commitment from donors or government. Non-negotiable short-term financing or 'pet' donor projects should be avoided (UNDP, 2013; Wurzinger et al., 2011). Recently, co-financing has become common for projects/programmes requiring long-term investments. Two or more collaborating partners can agree to co-finance a model concurrently, or a phased financing strategy can be agreed where organizations commit to provide financial support at different time periods of the model's implementation timeframe. As earlier mentioned, development of these financing strategies should begin during the model's pilot phase. The collaboration and networking among various development agencies, should be maintained sufficiently long enough to allow the breeding programme to incubate and reach a sustainable stage (Haile et al., 2011; UNDP, 2013). However, such long-term agreements require affirmative actions in terms of participatory programme planning and signing of written agreements detailing the funding modalities.

Access to formal financial services for small ruminant farmers in rural areas is a challenge. In pilot goat CBBPs, a provision for establishment of village saving and credit scheme (VSCS) was included in the project design. This has been instrumental for enhancing access to credit at affordable interest rates and other financial services for goat producers in the programme. Such arrangements should be extended to the scaled programme. Community animal health workers (CAHWs) and goat assemblers (middlemen) can access credit from such facility to expand their veterinary services and goat businesses respectively. Another option is to collaborate with an existing microfinance institutions in an area for provision of services to people who are investing in small ruminants production (Miller et al., 2012). It is important to lay-down concrete plans on how recurrent costs of the programme and the cooperative's activities will be financed after donor/government financing is phased out. The following options, or combination of these, should be considered: assisting the cooperatives to acquire

reliable income generating assets, introducing value-added fee on sold products or negotiating for government subsidy and/or any other strategy that will guarantee sustainable revenue generation. It is essential to realize that the overall vision for the whole programme should be to create a financially sustainable system in which smallholders use self-generated revenue to manage and sustain the operations of their breeding facilities and local cooperatives. Participation of the private sector, e.g. establishment of small ruminant abattoirs, participation of processors and retailers of small ruminant products can boost incomes of smallholders contributing to sustainability of smallholder breeding programmes. For this to materialize, initial long-term investments and government incentives are essential. Such incentives could include but not limited to: tax exemption on inputs for specific period, access to credit facilities and land etc. (Haile et al., 2019).

4.3.4.6 Creation of enabling environment

An assessment of the environment within which replication and institutionalization of the CBBP model must occur, should help to establish realistic scaling up goals, targets and the timeframe within which the goals and targets should be achieved. Literature on scaling up have repeatedly mentioned the enabling environment as an important factor in scaling up (Ajayi et al., 2018; Fatunb et al., 2015; Gündel et al., 2001; IFAD, 2015). This means creating the spaces (i.e., fostering the right conditions) for scaling up, which may include but not limited to: building effective extension systems, lobbying for policy reforms, considering cross-cutting issues and accounting for socio-cultural issues (WHO, 2010). During the process of scaling up goat CBBPs in Malawi and Uganda, stakeholders recommended establishment of the CBBP taskforce (composed of selected key stakeholders) to act as a steering committee to facilitate creation of enabling environment for scaling up the goat CBBP

model. Specifically, the CBBP taskforces in the two countries were mandated to investigate the following:

Policy support: - This involved analyzing whether the goal of the goat CBBP model aligns with current local or national development priorities and whether existing legal frameworks will support or hinder the CBBP initiative particularly in areas of small ruminant management and value chain development. Policies such phyto-sanitary regulations, pricing and taxation, monopolies in processing and trading can prohibit growth of smallholder goat/sheep enterprises. Emerging policies from other sectors like forestry, land husbandry and irrigation; regarding restriction of access to common resources such as rangelands, communal grazing areas, watering points, crop residues etc., can act as disincentives. The aim of such assessments was to lobby for reformation of such policies and legal frameworks and harmonization of conflicting policies (if they exist) in the countries of focus for the support of the goat CBBP scaling up activities. Secondly, the assessment was meant to look at possibilities for integrating the goat CBBP model into government small ruminant development programmes. The long-term vision was to achieve policy and institutional scaling up where formal government decisions are made to adopt the goat CBBP model at national or subnational levels. And to ensure that the model is institutionalized through national planning mechanisms, where systems and structures are adapted, and resources redistributed to build institutional support that can ensure sustainability. Hartmann and Linn (2008) asserted that the policy framework, laws, regulations and norms have to be supportive if innovations scaling up process is to succeed. IFAD (2015) cited lack of appropriate policy frameworks as one of the main reasons why scaling up of pro-poor livestock interventions fail. Effective and coherent pro-poor policies are crucial to capitalize on the growing opportunities offered to smallholder producers by the livestock sector. For example, the government of Argentina passed a “Goat Law” in 2006 which creates space for producers, processors, traders,

retailers and regulators to meet and negotiate for mutually beneficial policies, and to ensure access to pasture by all farmers (Miller et al., 2012).

Effectiveness of livestock extension system: - Appropriate technology and advisory services are the backbone of successful small ruminant projects. Producers need relevant and timely information on feeding, breeding, health, management, access to inputs, and market information for their products (Miller et al., 2012). Extension service play a key role in facilitating access to such information. In the pilot goat CBBPs in Malawi and Uganda, extension has been instrumental in facilitating implementation of the project. Besides provision of animal health services, extension officers have been a useful link between farmers and researchers and has been useful for farmer capacity building through technical and leadership trainings and facilitation of farmer to farmer learning through exchange visits, on-farm demonstrations, field days and agricultural/animal shows. Therefore, availability of effective extension service is one of the prerequisites for CBBP scaling up. Prior to commencement of the goat CBBP scaling up process, surveys were conducted in selected areas identified by user organizations for establishment of new CBBPs. The surveys were designed to assess availability of extension services and farmer's perceptions and willingness for participation in the programme and to understand a number of demographic, technical, socio-economic and socio-cultural, environmental and production system parameters. Before embarking on scaling up, collaborating partners need to have a comprehensive understanding of the environmental, cultural, and how local decisions are made in the family and social structures (Millar and Connell, 2010).

Harmony with cross-cutting issues: - Scaling up often calls for large changes which may have both positive and negative implications on society and the environment. Programmes that are in harmony or have potential to promote better management of cross-cutting issues (environmental sustainability

and gender equity) are likely to receive support from government, private and development sectors. In the past ruminants have been blamed for being responsible for accelerating soil erosion, desertification and emission of greenhouse gases. Although this is true to some extent, studies (Haque, 2018; Gerber et al., 2013) have demonstrated that with improved management in nutrition and husbandry practices these negative effects can drastically be reduced. In crop-livestock integration systems, small ruminants are instrumental in aiding nutrient recycling. Valueless crop residues are fed to animals for production of high value products (meat and milk) and manure. Livestock manure have the capacity to revitalize unproductive soils to boost crop production. Furthermore, the goal of CBBPs is not to increase flock sizes but rather to improve growth performance and reproduction to increase offtake rates. Small ruminants have the potential to contribute to gender equity through economic empowerment of women and the youth. Indigenous small ruminants are easy to manage and do not require large investments unlike large ruminants, hence they can be owned by the landless including female and youth headed households (Miller et al., 2012; Sansoucy, 1995).

4.3.4.7 Monitoring and Evaluation

Effective monitoring and evaluation (M&E) is a critical component of an effective scaling up strategy. Successful scaling up requires regular feedback from monitoring and evaluation systems. (Brizzi,and Mangiafico 2014; Hartmann and Linn, 2008). Since it is recommended to plan scaling up in pilot/experiment stage of the programme, three monitoring and evaluations phases should be distinguished. These include monitoring and evaluation of outputs and outcomes of the pilot project, monitoring and evaluation of the processes of scaling up and M&E of the outputs and outcomes/impacts of the scaled programme. M&E of the pilot programme establishes whether the tested model has been successful and lessons of what worked and did not work, have been established.

The M&E of the scaled programme establishes whether the expected outputs and outcome/impacts on the targeted beneficiaries have been realized, while monitoring system for the scaling up process provide feedback on whether spaces (right conditions and enabling environments) are being created for scaling up to succeed and the programme to be sustainable. WHO (2010) noted that while scaling up goals and objectives need to be kept fixed, the scaling up processes should be implemented with a 'learning by doing' culture/attitude, one that values adaptation, flexibility and openness to change. The monitoring system should be designed to capture important feedback from processes, dissemination partners, beneficiaries, communities and field-based staff. These should continuously and collectively be discussed for learning and adjustments to take place. In the goat CBBP scaling process, the special CBBP scaling up taskforces were set up and mandated to facilitate and carry out regular monitoring and evaluation of CBBP scaling up/out progress. Specifically, the taskforces in collaboration with the resource teams in Malawi and Uganda were responsible for monitoring whether or not the prerequisite key spaces (institutional, policy review, resource mobilization, etc.) were being created to permit the scaling up pathway to proceed as planned; and if not, to identify possible causes and take necessary remedial actions. Indicators of progress were developed to be monitored at an agreed interval and reported in the agreed format. February and September every year, were set for annual review workshops where among other things special monitoring and evaluation reports would be presented and discussed. Generally, the goat CBBP scaling up process and the activities of the taskforces in both countries have been hampered by unavailability of funds.

4.3.5 Important aspects to consider prior to model rolling out

4.3.5.1 System thinking

A systemic approach is essential when planning for scaling up. This means being aware of the interdependency of the scaling up strategies and the need for a holistic and integrated implementation of all the strategies for best results. Absence or deficiency in one strategy affect the others. This is clearly demonstrated in the goat CBBP scaling process in Malawi and Uganda and the outcomes of attempted scaling up of pro-poor initiatives highlighted in Table 6 below. Success was registered for initiatives that employed most of the scaling up strategies. Partial implementation of the strategies resulted into failure or unsatisfactory performance leading to low adoption and programme unsustainability. Therefore, striving for a balanced mix of the strategies is instrumental for successful scaling up and building of sustainable programmes.

Table 6: Outcomes of attempted scaling up of pro-poor initiatives in developing countries.

Project	Location	Scaling up success/challenges	Major lessons	Reference
Community-Based Sheep Breeding Programme	Ethiopia	Stagnated scaling up progress due to uncoordinated and disjointed scaling up efforts by collaborating partners.	Unclear scaling up goals, strategies and roles of resource team	(Gutu et al., 2015)
Community-Based Goat Breeding Programme	Malawi and Uganda	Adoption of the model by dissemination partners affected by budgetary integration and harmonization issues	Unclear scaling up financing strategy and late engagement of dissemination partners	Personal experience by author
FARM Africa Meru Dairy Goat and Animal Healthcare Project	Kenya	Adoption increased from 500 to 5,320 households, covering 75 districts within a period of 12 years. Average household flock size increased by 167%	Inherent attributes of the model, good enabling environment e.g. the [1]CAHWs, good partnership, and determined resource team.	(Peacock and Hastings, 2011)
Enhanced Preservation of Fruits using hexanal-based technology-Enhanced Freshness Formulation (EFF).	India	India classified EFF as an insecticide under the Central Insecticide Board (CIB), and not as an organic compound. Negotiations took 4 years before regulatory reforms ware approved	Failure to conduct policy and regulation framework analysis and consultation with policy makers at pilot project inception	(Shilomboleni and De-Plaen, 2019)
Achieving Impact at Scale through ICT-enabled Extension Services	Ghana	Despite the project's success in increasing yields, this did not translate into increased revenue and profitability	Inadequate resources to address marketing and value chain issues and monitoring and evaluation	(Shilomboleni and De-Plaen, 2019)
Forages for Smallholders Project (FSP)	Lao PDR	Within a year adoption increased by 196%	Good partnership, attributes of the technology. Weakness: No systematic evaluation of impact.	(Millar and Connell, 2010)
Scaling up the Adoption of Fodder Shrub Innovations in East Africa	Kenya, Tanzania and Uganda	Total of 205,000 smallholder farmers adopted the technology. Currently, fodder shrubs contribute US$3.8 million annually to farmers' incomes.	Early involvement of dissemination partners, policy and value chain analysis, inherent attributes of the model and farmer organizations	(Wambugu et al., 2011)
Financial Inclusion for Improving Sanitation and Health (FINISH) Project	Kenya	The Community-Led Total Sanitation (CLTS) achieved 100% open defecation-free villages	Success was due to: -microfinance institutions -business model for masons -support by policy framework	(PPPLab, 2017)

[1]Community Animal Health Workers

4.3.5.2 Assessment of strategy preparedness and scaling up legitimization

After implementation of the pilot project, before commencement of the scaling up process, it is essential for the resource team, dissemination partners and other co-opted individuals to jointly conduct an assessment to determine whether the scaling up ingredients/strategies have been thoroughly prepared and perfected. Table 7 is a template to facilitate such an assessment. Each scaling up ingredient is a criterion for assessment and is divided into sub-criteria on which scores are to be made. Different scales for scoring can be used, for example a scale of 1 to 5 can be used, where a score of; 1 = not-prepared, 2 = slightly-prepared, 3 = fairly-prepared, 4 = sufficiently-prepared and 5 fully-prepared for scaling up. The scoring can be done by individual members of the resource team and dissemination partners, but to eliminate subjective bias it is better to conduct the scoring in a workshop setting where the preparedness of each sub-criterion is discussed, and a joint score agreed. This assessment will help to determine the preparedness and strengths of the model for scaling up and sustainability and pinpoint weaknesses that need remedial actions. Scaling up legitimization is an important strategy to minimize the likelihood of failed efforts. It is the process of obtaining ratification from relevant respected opinion leaders and high level decisionmakers from public, private and development sectors. They must endorse that, indeed scaling up the technology/model is a viable option to address the problem/need which is widely being perceived as critical (Cooley and Kohl, 2006). Where possible, legitimization can be combined with assessment for strategy readiness or can be carried out soon after the assessment.

Table 7: Model/technology assessment for readiness for scaling up and sustainability

Criteria for assessment (Scaling up ingredients)	Sub-criteria	Scorers 1 2 3	Overall score	Remarks
*Capacity of resource team and user organizations	• Availability of relevant personnel • Resource mobilization skills • Negotiation and leadership skills • Availability for long-term facilitation			
Attributes of the model	• Relevance for providing solution to existing problem(s) • Advantageous over alternatives practices • Simplicity and adaptability • Compatibility with values, norms, facilities resources etc. • Compatibility with development agendas (local/national)			
Awareness and demand	• Early (pilot) involvement of dissemination partners • Participatory planning of scaling up programme • Collective development of resource mobilization strategies • Existence of a functional scaling up committee • Engagement of key value chain actors			
Market-based strategies and value chain	• Market analysis and value chain study conducted • Adequate capacity building for smallholders • Functional community-based institutions established • Improved disease control and nutrition strategies developed			
Financing strategy	• Medium/long-term financial support for scaling up secured • Financial services available to support all value chain actors • Strategies for creating a sustainable financial system for smallholders' institutions developed			
Enabling environment	• Analysis of policies and regulation frameworks conducted • Good extension services in place • Model supports better management of cross-cutting issues (gender equity and environmental sustainability)			

*Resource team and user organizations can be assessed together or separately

5 Conclusions

In all the study areas, goats were primarily raised to generate cash revenues as shown by increased proportion of sales of live goats. A high proportion of household revenue was contributed by goats meaning that goats are an important source of income among resource poor households. As demonstrated in this study, it can be concluded that indigenous goat production is profitable and economically viable. The average positive net profit (without intangible benefits) and the return on capital observed in this study means that smallholder farmers can take advantage of the low production cost of goat enterprises to invest in goat production and realize meaningful returns. The high mean net profit and return on capital realized by Zombwe farmers is due to the fact that they sold more breeding stock than any other site. The intangible benefits of goats effectively increase a household's income and improve its purchasing power, thereby providing current and future economic stability to the rural household economy. Hence, programmes like goat CBBPs are meant to harness the potentials of indigenous goats through improvement of genetic performance and husbandry practices, capacity empowerment of the goat farmers, establishment of community-based institutions (goat producers' cooperatives) and advocacy for creation of conducive policy environment. The aim is to optimize contributions of indigenous goats towards reduction of rural poverty and hunger. Therefore, financing and supporting scaling up of such programmes is a meaningful direct investment into the development of rural economy.

The experiences and lessons from the goat CBBP scaling up process in Malawi and Uganda and the outcome of selected scaled-up pro-poor initiatives in developing countries, clearly demonstrate that successful scaling up of a proven model does not just happen by itself, it requires strategic planning and collaborative facilitation. A systemic approach is essential when planning for scaling

up. This means being aware of the interdependency of the scaling up strategies and the need for a holistic and integrated implementation of all the scaling up strategies. Smallholders are the key players for creation of sustainable CBBPs. Meaningful investment is however required to build their capacity and local institutions to facilitate creation of self-sustaining community-based breeding institutions. Investments in institutional/policy reforms, collaborative programme planning and long-term concerted and coordinated efforts by collaborating partners are therefore essential. Permanently established actors like government agencies and research and training institutions are better placed to coordinate such efforts. Although NGOs and donors are potential partners to provide financial resources and other technical backstopping, their support are usually limited by projects/ programmes timeframe. The overall goal of the scaling up programme should be creation of a financially sustainable system in which smallholders are able, on their own, to transact and sustain the operations of their local breeding institutions using locally generated revenue.

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