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Contents

1 Acknowledgments

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2 Executive summary

Developing value chain innovation platforms to improve food security in East and Southern Africa (VIP4FS) project was funded by ACIAR and implemented in two sites in Uganda (Kapchorwa and Manafwa districts) and one site in Zambia (Solwezi district) from 2015 to 2019. The project aimed at identifying principles and drivers that support scalable establishment of effective and equitable innovation platforms (IPs) that enhance food security through greater engagement of smallholder farmers with markets. It was designed around five specific objectives and guided by three key research questions, namely: (i) What are the most effective mechanisms for rural institutional strengthening and how does institutional structure affect benefit streams and opportunities for value chain development? (ii) What are the best fit value chain development strategies and key attributes of market information delivery systems that contribute to the success of IPs in enhancing rural enterprise development? and (iii) How effective are different approaches to value chain IP development at raising farm and rural enterprise profitability and improving rural incomes while maintaining the natural resource base?. The project was led by ICRAF and implemented in collaboration with National Forestry Resources Research Institute, Makerere University and Kapchorwa District Landcare Chapter in Uganda and Zambia Agricultural Research Institute and Copperbelt University in Zambia. International partners included University of Adelaide, Landcare International, Australian Landcare, African Landcare Network, Wageningen University and Gottingen University.

The desire was to achieve farmer coalitions with high social capital and increased access to markets which was achieved through formation of innovation platforms, strengthening their capacities, improving productivity and connecting IPs to markets. Six value chains — coffee, dairy and honey in Manafwa and Kapchorwa and Soya beans, Solwezi beans and village chicken in Solwezi —were selected based on eight-point criteria developed by the project team. These were further screened based on their economic, social and technological feasibility and finally three value chains —dairy and coffee in Uganda and village chicken in Zambia—were developed. Value chain development strategies were implemented and tested through planned comparisons (PCs)- social- experiments- to better understand what works, where, and for whom.

The results show that the use of IPs can be an effective approach for organizing smaller farmer groups into larger coalitions that bring together all the key value chain actors to work collectively to unlock the potential of agricultural value chains including facilitating access to high end markets with increased financial benefits to smallholder farmers. The use of PCs is a significant shift towards involving many farmers in implementing different options under varying contexts, in particular, the use of citizen scientists to share results and experiences through local dissemination sessions is critical in facilitating information dissemination and adoption of improved practices.

The project enabled national partners in both Uganda and Zambia to build their capacity in use of new approaches in research and development such as Innovation platforms, planned comparisons, citizen science and behavioural economics. This facilitates mainstreaming of such approaches into other national programs and projects thus achieving scaling and sustainability of interventions. We note that commercialization of smallholder agriculture can benefit greatly from clear strategies for engaging with the key private sector actors to facilitate access to markets. The collaboration on the project between academia, national scientists and regional research centres has yielded synergies through which novel approaches have been shared. The application of behavioural economics unlocks possibilities of Ugandan coffee meeting global specialty coffee standards. Similarly, the use of citizen science provides a new path to research in development for unlocking agricultural value chains.

Through this project, the capacity of over 4,950 smallholder farmers was built on IPs focusing on village chicken, dairy and coffee value chains in Uganda and Zambia. Improved quality of coffee cherries and post handling was achieved among 1,900 farmers and IPs from Mt Elgon region were able to export one ton of specialty coffee with a high cup score to Australia for the first time thus attracting higher premiums. Two specialty coffee wash stations, one managed by a women IP have been established. Honey IPs have established three bee houses each with a capacity of over 100 beehives and are producing branded honey. This is a big shift from a traditional practice of keeping bees in a nearby Mt. Elgon National Park. Adoption of improved dairy feeding among 1,300 dairy farmers has resulted in doubling of milk yields.

We recommend that for better women participation and change in decision making in value chain development, projects should go further in ensuring that information and interventions are tailored and relevant to women even in 'women' focused value chains such as village chicken. Projects also need to identify gaps and needs of women and make deliberate efforts to address such gaps. Through interactions created during implementation of this project, national partners as well as the many students gained exposure and skills in reach and development approaches. This cross-institutional collaboration and learning was highly beneficial and recommended in future ACIAR projects.

3 Background

Agriculture and agribusiness in the Eastern and Southern Africa region present abundant opportunities for development in ways that benefit smallholders and the rural poor. The region's agricultural sector is currently experiencing an unprecedented period of progress, change and expansion. Farm production combined with the value added from agribusiness operating along value chains, including trading, processing, distributing, retailing and exporting of products, represents around 45% of the region's total economic output. A decade of economic growth throughout Sub-Saharan Africa is reshaping food value chains in fundamental ways as income, urbanization and demographics influence agricultural markets. The World Bank estimated that the value of urban food markets will increase fourfold over the next two decades, exceeding US$ 400 billion by 2030 (World Bank, 2013). The region's rapidly expanding middle class is seeking much more food, greater dietary diversity, protein rich foods, higher quality products and enhanced food safety.

The dilemma for the development community, is that the many opportunities for smallholders to benefit from this growing demand for higher value food, and evolving value chains, remain elusive. A considerable literature points to several major constraints to smallholder participation, especially amongst women producers, making it difficult for them to share in the benefits of growth. A key issue is that smallholders and rural firms lack access to appropriate skills, information, technologies and markets (Brenton, 2012, World Bank, 2013). One widely acknowledged reason for this relates to failures of traditional approaches to innovation in agriculture, especially the top down, linear design of extension services (Knickel et al 2009).

To increase adoption, recent agricultural innovation programs have created 'coalitions of stakeholders' to identify and address local agricultural development problems. These stakeholders form an innovation platform (IP): 'a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance'. In an agribusiness context, IPs are referred to as multi-stakeholder platforms providing an equitable and dynamic space to bring heterogeneous actors together to design activities, exchange knowledge and take action to solve a common problem (ILRI 2012 and Cadilhon et al 2013). We anticipated that harnessing the social capital developed around sustainable land management to also address value chain integration could significantly increase benefits accruing to smallholder farmers and that this is a generalizable result that can be applied in a wide range of contexts both in Uganda and Zambia.

Evaluations throughout Africa suggest that IPs that engage local producer knowledge in a collaborative framework with value chain partners are more successful than traditional research and extension systems. This research focused on identifying what makes value chain innovation platforms that incorporate value chain development strategies, successful in terms of institutional, technological and market factors, that determine IP performance and how the establishment of IPs can be most cost-effectively scaled up across a range of contexts using planned comparisons (PCs) approach.

This project also championed the use of landcare principles. The Landcare movement, that began in Australia and has spread to over 20 countries worldwide, shows how collective action can contribute to sustainable land management practices and improve livelihoods at farm and landscape scales. Landcare is a viable model for conserving the environment and natural resources, effective public–private partnerships, and authentic stakeholder participation in community action and decision making (Catacutan et. al., 2009). Moreover, one of the project partners, the Kapchorwa District Landcare Chapter (KADLACC) had been particularly successful in using landcare for bringing together stakeholders, facilitating community action in soil and water conservation, as well as championing local level innovations.

The project was aligned with the key objectives outlined in ACIAR's 2014-2018 Strategic Plan, including delivering new and diversified enterprise options, particularly for women; enhanced market chains for smallholder agriculture; and increased productivity, quality and market access for agriculture and agroforestry products.

4 Objectives

4.1 Overall Aim

The aim of the project was to identify principles and drivers that support scalable establishment of effective and equitable innovation platforms that enhance food security through greater engagement of smallholder farmers with markets.

4.2 Specific Objectives

The project was designed around five specific objectives (work packages):

1. To assess smallholder livelihoods, institutional arrangements across scales, and identify drivers that enable value chain IP development for sustainable agricultural commercialisation.
2. To identify best fit value chain development strategies and market information delivery systems and examine their influence on the success of value chain innovation platforms in enhancing rural enterprise development.
3. To develop and evaluate scalable approaches for promoting value chain innovation platforms among smallholders and other stakeholders in ways that generate inclusive and sustainable economic benefits.
4. To engage with and strengthen the capacity of key stakeholder groups to both enhance the research process and promote the widespread scaling up of approaches generated by the project.
5. To systematically monitor and review project implementation and evaluate its outcomes and impacts.

4.3 Research questions

The project was guided by three key research questions:

1. What are the most effective mechanisms for rural institutional strengthening and how does institutional structure affect benefit streams and opportunities for value chain development?

2. What are the best fit value chain development strategies and key attributes of market information delivery systems that contribute to the success of IPs in enhancing rural enterprise development?

3. How effective are different approaches to value chain IP development at raising farm and rural enterprise profitability and improving rural incomes while maintaining the natural resource base?

5 Methodology

5.1 Project sites

The project was implemented in Uganda (Mt. Elgon region) and Zambia (North western province). In Uganda, the project covered two districts (Kapchorwa and Manafwa) though during the cause of implementation Namisindwa district was curved out of Manafwa **(Figure 1).** For Zambia, the project covered Solwezi district however this was also divided into three districts (Solwezi, Kalumbila and Mushindamo) during the time of the project (**Figure 2**).

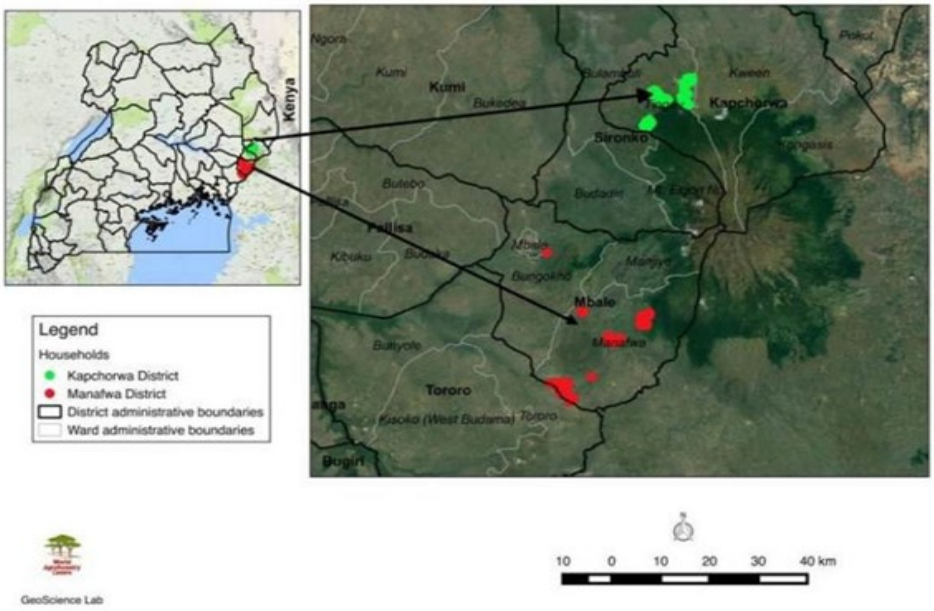

Figure 1: Map of Uganda showing the location of project sites (Kapchorwa and Manafwa districts)

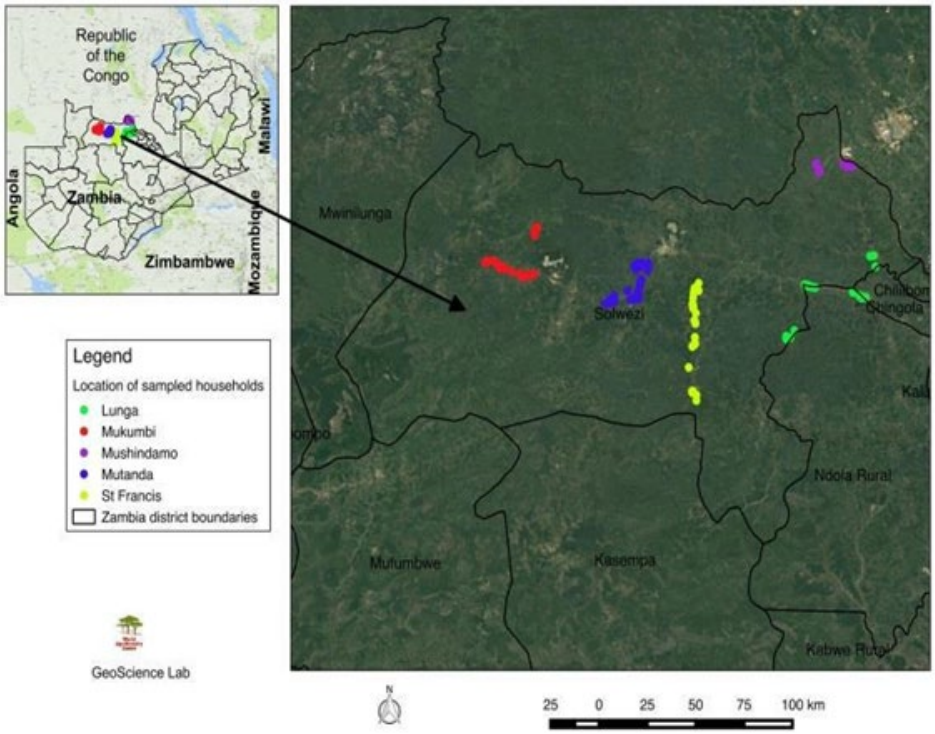

Figure 2: Map of Zambia showing the location of project site (Solwezi district)

5.2 Justification for site selection

The research used three sites with contrasting initial scenarios to address critical questions about how farmers can become better linked to markets through value chain IPs, which are innovation platforms that incorporate value chain development strategies and capture more value for what they produce while managing natural resources sustainably through the landcare approach. The first scenario was evident in Kapchorwa district in Uganda, where landcare principles were earlier applied to build and nurture social capital to support sustainable land management. In this case there was some level of rural institutional grassroots support and empowerment of community members. Though there was evidence of a variety of rural enterprises, the public private partnerships necessary to unlock opportunities for market access and increased income were insufficient.

The second scenario that was evident in Solwezi district in Zambia involved great potential for public private partnerships and market access through the demand from the mining industry for agricultural products but farmer networking necessary to provide economies of scale and the institutional support for rural enterprise development were lacking. Manafwa District in Uganda provided a case in which development of farmer networks was in a nascent stage with no clear evidence of active public private partnerships. The use of two countries enabled contextual comparison to provide broad-based lessons about impacts of improving rural institutional capacities and private sector engagement. As illustrated in **Figure 3**, the aim was to move systems towards the top right quadrant enabling sustainable livelihood improvement, with different pathways relevant to different initial conditions.

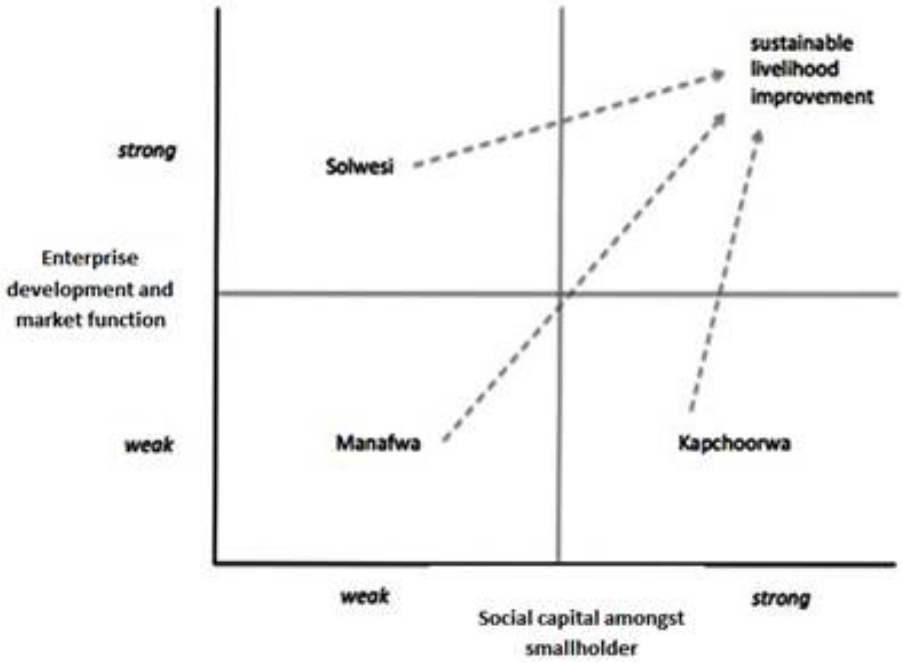

Figure 3:Initial conditions and improvement pathways in 3 case study contexts

5.3 Project team

ICRAF was the lead institution in the development and implementation of this project. The project therefore leveraged on ICRAF's convening role to bring together key institutions in Uganda (National Forestry Resources Research Institute, Makerere University and Kapchorwa District Landcare Chapter) and in Zambia (Zambia Agricultural Research Institute and Copperbelt University) to work with local governments to develop and test the scalability of establishing value-chain IPs. In addition, several international partners were involved during the implementation of the project, including: University of Adelaide, Landcare International, Australian Landcare, African Landcare Network, Wageningen University and Gottingen University.

5.4 Research approach

The project adopted the sustainable livelihoods framework to identify opportunities for inclusive and sustainable value chain development to achieve balanced improvement of key livelihood assets (human, social, natural, physical and financial) as elaborated in the 5 capitals tool (Donovan and Stoian, 2012). This links household access to livelihood assets with greater well-being and resilience. Likewise, the economic viability and performance of smallholder enterprises is linked to their access to business assets. We used this framework to assess the extent to which pre-existing asset endowments determine the outcomes of value chain development, relationships between asset building at enterprise and household levels, and the role of market, political and institutional factors in facilitating or hindering favourable outcomes, separating the changes caused by interactions and interventions in value chains from those induced by the overall context. Trade-offs and synergies amongst natural, social and financial assets were considered.

Within the project, the different teams aimed to move the different communities within the districts predictably towards the second quadrants with high social capital and increased access to markets (**Figure 3**). This was achieved through:

i) formation of innovation platforms in the different districts and strengthening their capacities on group dynamics, trust, conflict resolution,
ii) training of innovations platforms on improved management practises which could improve overall productivity, and
iii) connection of farmers to markets in all sites.

Coupled with enhanced social capital, these were envisaged to allow movement of groups towards the desired quadrant with strong social capital and strong market access.

The project also used a collaborative effort between farmer groups, community-based organizations, NGOs, local governments and research institutions to promote sustainable land management programs. By training farmers on landcare principles, it was possible to sustainably raise household farm productivity and income through improved land and water management at farm and landscape scales. These groups were also connected to markets, which was the new research that the project addressed. Scaling up within the case study districts was embedded in the project design as a mandate of project partners. Scaling out was also inbuilt through the CGIAR program on Forests, Trees and Agroforestry (FTA) research in development impact pathway and the Landcare network.

5.5 Study methods

The study methods are presented under the three research questions that were being investigated:

Research Question 1: *What are the most effective mechanisms for rural institutional strengthening and how does institutional structure affect benefit streams and opportunities for value chain development?*

The project identified and characterized grassroot institutions and their members. At the beginning, capacity needs of groups and IPs were assessed using a Rural Institutions Diagnostics Survey (RIDS) tool with an aim of identifying maturity levels and capacity gaps of farmer groups in different sites. The RIDS tool used several criteria and indicators including group dynamics, marketing techniques and value addition to assess the levels of maturity of farmer groups and categorized them into novice, intermediate and mature groups. From the analysis of results, the project team then identified ways to address the identified gaps in order to articulate support measures necessary for different types of partnerships.
A baseline survey was also conducted in 2016 where 210, 80 and 64 farmer groups were interviewed in Manafwa, Kapchorwa and Solwezi districts. The survey was aimed at:

i) providing baseline information on farmer groups and institutions in the area,
ii) obtaining indications of farmer groups level of performance through a rural institutions diagnostic tool, and
iii) determining capacity gaps that exist and interventions that could be adopted to address the gaps.

Research Question 2: *What are the best fit value chain development strategies and key attributes of market information delivery systems that contribute to the success of IPs in enhancing rural enterprise development?*

This research question aimed at addressing two aspects that were critical in the development of value chain IPs, namely; identification of best fit value chain development strategies for different categories of beneficiaries (women and young people), and the role of market information delivery systems in strengthening value chains by reducing information asymmetry and enabling trust and long-term contractual arrangements to thrive. In particular, the research assessed how market information delivery systems in different community groups varied across farm, landscape and district scales.

Comprehensive review of literature on potential value chains and market information delivery systems including gaps and opportunities formed the foundation of this objective. A scoping study was conducted in the three study sites to validate potential value chains identified through literature. Sub-counties (Uganda) and farming blocks (Zambia) included in the scoping study were selected through consultative meetings between the project team and the district teams. Data was collected through key informant interviews and focus group discussions. Key informant interviews were mainly conducted with value chain actors, supporters and enablers. Value chain actors interviewed included traders, input suppliers and processors while value chain supporters and enablers consisted of representatives of government and NGOs who were well conversant with agricultural and natural resources related value chains. Financial service providers were also interviewed as part of value chain supporters. Government representatives were mainly drawn from staff in the departments of veterinary, agriculture, natural resources, community development, trade and commerce. Other value chain actors such as traders, input suppliers and processors were identified through snowball approach whereas producers, who were the main participants in the focus group discussions were selected based on their knowledge of farming practices and marketing in their respective zones and villages.

Information from the scoping study was used to develop eight-point criteria for selecting a few value chains for further screening based on their economic, social, technological, institutional and political feasibility. The criteria, which were aligned to the project objectives, were developed through consultative meetings with the implementing partners in each country who were

instrumental in contextualising the criteria to suit each country's context. The eight-point criteria included:

(i) potential for large impact, particularly for women and the youth,
(ii) prospects for tractable interventions that could yield useful results from planned comparisons,
(iii) existence of the private sector actor(s) who could be approached to co-finance planned comparisons,
(iv) existence of development partners who are already working on the value chains to effect interventions,
(v) co-benefits to smallholder livelihood systems,
(vi) availability of resource persons within the project team,
(vii) clear institutional access necessary to effect change and
(viii) supportive policy context within which the interventions can be developed.

Based on this eight-point criteria, six value chains — coffee, dairy and honey in Manafwa and Kapchorwa and Soya beans, Solwezi beans and village chicken in Solwezi —were selected among 16, 17 and 17 potential value chains in Manafwa, Kapchorwa and Solwezi, respectively. The six value chains were subjected to further screening to examining their economic, social and technological feasibility and identify strategies for their development. A structured survey of producers and key informant interviews of downstream actors was conducted. The structured survey was administered to 306 ,301 and 427 producers in Manafwa, Kapchorwa and Solwezi, respectively. The producers in Kapchorwa and Manafwa were drawn from three sub-counties in each district while those from Solwezi were sampled from five agricultural blocks. A total of 18, 16 and 24 traders dealing in the six value chains were interviewed in Manafwa, Kapchorwa and Solwezi, respectively. In addition, two coffee processors and one soya beans processor were interviewed in Kapchorwa and Solwezi, respectively.

Research Question 3: *How effective are different approaches to value chain IP development at raising farm and rural enterprise profitability and improving rural incomes while maintaining the natural resource base?*

The major thrust under this research question was to investigate two issues; (i) the extent to which different approaches to value chain IPs development result in higher economic benefits for participating smallholders on the one hand and the effective management of local natural resources on the other, and (ii) Which approaches for promoting eco-smart value-chain IPs among smallholders and other actors are likely to be successful in different contexts?

In this regard, planned comparisons (PCs) were used as a basis for developing efficient and effective ways to promote establishment and development of value chain IPs among smallholder farmers and other actors, at scales that generate significant economic, social and environmental benefits, and determining key considerations that would be taken into account in rolling out interventions. A behavioural science approach was used to understand the basis for farmer/producer choices.

Different value chain development strategies were tested through planned comparisons (social-experiments) to better understand what works, where, and for whom. They provided the evidence to guide investment decisions and to target interventions to where they were most likely to be effective. In addition, PCs generated information to support further design or modification of the options that were being considered, as well as contributing to scientifically sound knowledge to the global knowledge base. Three PCs focusing on three value chains —dairy and coffee in Uganda and village chicken in Zambia—were developed and implemented.

5.6 Dairy planned comparison

Dairy planned comparison aimed at testing cost effective ways of motivating smallholder dairy farmers to take up improved feeds and feeding practices, with a view to improving milk yields in

Kapchorwa and Manafwa districts in Uganda. Results from the scoping study as well as the value chain characterization study revealed that the dairy sub-sector had the potential to improve food security and livelihoods of smallholder farmers in Eastern Uganda, yet its productivity was constrained by poor feeding practices and limited availability of improved feeds. Although farmers in the two districts in Uganda owned at least one improved cow, which the households depended on for food and income, the cows were mainly fed on banana pseudo stems, which have low nutritional value (very low in proteins) and occasionally supplemented with elephant grass. Use of commercial concentrates was not feasible for smallholder dairy farmers because of the high cost. Studies undertaken on high value fodder trees such as *Calliandra calothyrsus* revealed that such species can increase milk yield significantly if they are fed to dairy farmers in the recommended quantity and quality (Paterson et al 1999 and Makau et al 2019). Yet majority of smallholder farmers had limited knowledge of high value fodder shrubs including how to prepare them and the quantities to feed. Besides, studies have showed that where fodder shrubs had been introduced, adoption rates were generally low, despite reported evidence of their potential to increase milk yields. To bolster uptake of fodder shrubs among the farmers, there was need to use an innovative extension approach that could induce behaviour change among the farmers. Due to the heterogeneity among the farming population, identification of a contextually appropriate approach was critical. Planned Comparisons (PCs) provided an opportunity to test the effectiveness of two scaling approaches—provision of information and peer-to-peer learning—in improving uptake of fodder shrubs among smallholder farmers in Kapchorwa and Manafwa districts. Peer-to-peer learning, whose effects on inducing behaviour change among farmers who consider themselves as peers as grounded in extension literature was compared against the business as usual approach which entails training and provision of planting materials. The effectiveness of these two approaches was checked against a control group, which was not subjected to any of the interventions until after the experiment was completed. The three treatments are briefly described below:

i) **Information + nursery establishment:** In this treatment, training was delivered as a standard extension training session for one day. Topics covered included: different fodder shrub species and their benefits; where to access the planting materials, as well as linking farmers with the providers/sources of the planting materials; how to grow fodder shrubs reflecting on the available niches; how to manage them; and appropriate feeding practices. Demonstrations of good feeding practices were also included in the training programme. To address the low access of fodder shrubs, a fodder shrub nursery was established in each village or village cluster, which included a variety of appropriate species. These were to be ultimately run as village micro-enterprises after the end of the project.

ii) **Information treatment + nursery establishment + participatory comparisons with reward system for participating 'citizen scientists':** In this treatment arm, 'citizen scientists'—selected via lottery where there was over-subscription of interest—were asked to participate in a pseudo-experiment, with results periodically presented to the wider community of local dairy farmers through community feedback sessions. One team of citizen scientists was provided with fodder shrub (calliandra) as the community fodder nursery was being established, while others continued to feed their dairy cows the way they had been doing (business as usual scenario). Both sets of participating dairy farmers were required to keep a record of their feeding practices and milk yields, using simple record keeping tools provided by the project team. These were complemented by several community-level dissemination of the results of these pseudo-experiments—both with the before/after and with/without scenarios.

iii) Waiting group. This group did not receive any treatment, but they were included in both the baseline and end-line surveys. This group was important for detecting changes. They were however considered for capacity building activities at the end of the final survey so that they did not feel marginalized.

5.7 Village chicken planned comparison

The scoping study results as well as the feasibility assessment of the village chicken value chain revealed that the value chain had the potential to improve incomes and livelihoods of smallholder farmers in Solwezi. Yet, village chicken rearing in Solwezi was undertaken at subsistence level.

High rates of chick mortality and disease incidences among mature birds coupled with less structured markets for village chicken acted as disincentives for smallholder farmers in Solwezi to venture into village chicken rearing as a business. Thus, it was critical to find out contextually appropriate cost-effective ways of motivating smallholder farmers in Solwezi to increase investment in village chicken and transition from subsistence to commercial production. Three approaches — market linkage; market linkage and provision of targeted information; and market linkage, provision of targeted information coupled with an incubation and vaccination system—were tested for their cost effectiveness. The planned comparison on village chicken was implemented in two agricultural blocks, namely St. Francis and Mutanda. A total of 46 zones, drawn from 8 camps in the two blocks **(Figure 4)**, were assigned to the different treatment groups and balancing test performed on the baseline covariates. A brief description of the approaches tested is as follows.

i) **Buyer collection points:** This treatment was basic, but potentially very cost-effective. Collection points were set up for camp zones assigned to this treatment arm at agreed locations and pick-up times, e.g. once per month. Households were informed and reminded of the opportunity and prices to be offered at the time of collection. One or more buyers willing to make the collection rounds and payments were identified and facilitated, particularly in the beginning when the low economies of scale could make the venture economically unviable unless subsidized.

ii) **Buyer collection points + training:** In addition to the above collection point treatment, producers in this set of camp zones were also exposed to basic training on local chicken management and marketing. Here, they were provided with information on (a) demand and price (market potential); (b) key buyers (local and within the district) and recommended marketing practices; and (c) recommended village chicken husbandry practices, including feeding, disease control and housing. Visual aids and demonstrations were key pedagogical techniques used.

iii) **Buyer collection points + training + community incubation and vaccination services:** In these camp zones, in addition to the buyer collection points and training, lead chicken producers were identified, trained, and provided with low-cost and locally appropriate incubators, as well as vaccination kits. Other village chicken producers from within the camp zones assigned to the treatment were encouraged to bring their village chicken eggs to be incubated. They received vaccinated chicks in exchange, proportional to the number of eggs that hatched. The chicks where vaccinated within the recommended vaccination window for Newcastle disease, which should be administered on the 4^{th} and 8^{th} day after hatching.

   At the later stage, especially where incubator system proved to work well, the village chicken producers were to be given part of their payment for chicken delivered to the buyer in vouchers. The vouchers could be directly exchanged for vaccinated chicks from the camp zonal incubation facilities. This was expected to evolve into self-sustaining businesses especially if the producers saw that the benefits greatly outweighed the costs associated with utilizing the incubation services. This was intended to put the maturation rates of local chicken on a more consistent schedule, something that was in the buyer's direct interest for achieving increased economies of scale. However, it is important to note that the voucher system did not take effect because the intervention involving the incubator and vaccination was not successfully implemented following frequent power outages in the zones where the incubators were located. Therefore, village chicken producers continued to receive payment for the chicken in cash.

iv) **Waiting group:** This group did not receive any treatment, but they were included in both the baseline and end-line surveys. They were however considered for capacity building activities at the end of the final survey so that they do not feel marginalized.

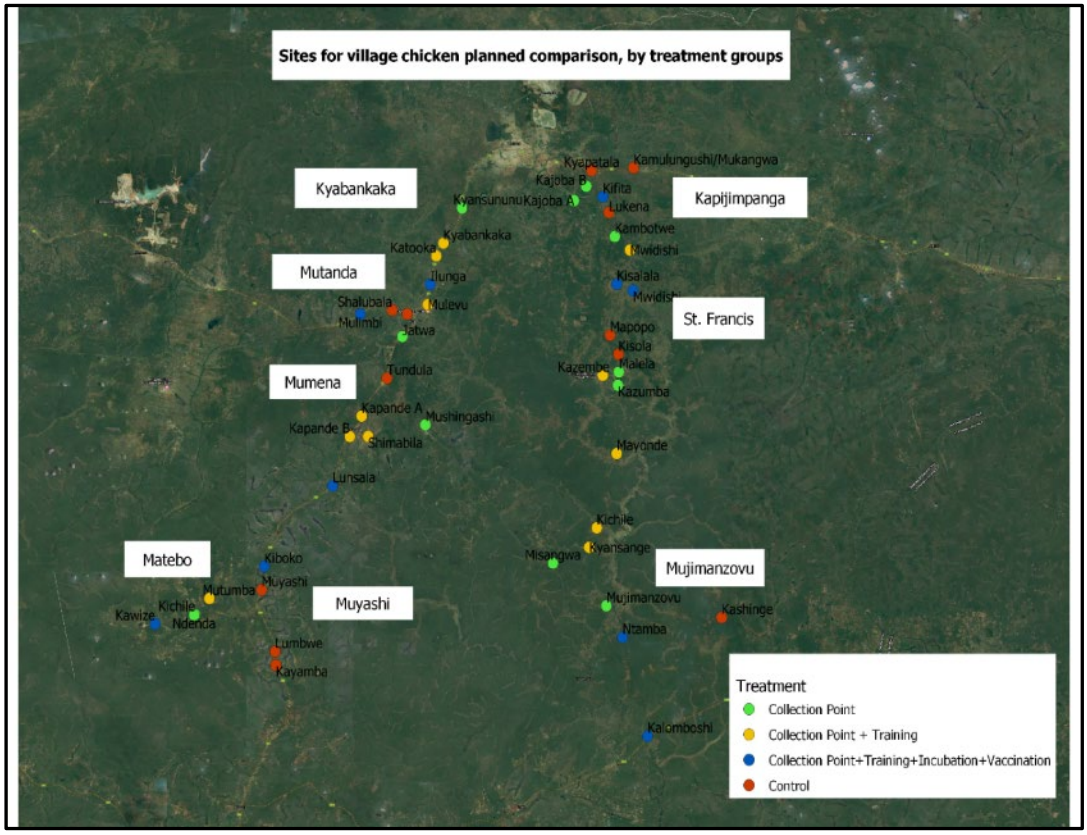

Figure 4: A map of Solwezi showing the distribution of village chicken planned comparisons treatments in different camps and zones

5.8 Coffee value chain

The main challenge facing farmers involved in the coffee value chain in Uganda was identified as low coffee returns due to low quality of coffee stemming from sub-optimal harvesting practices. The interventions were therefore aimed at demonstrating to farmers how smallholder coffee farmers could be encouraged to cost-effectively engage in selective harvesting that increases both the quality and the quantity of coffee that they sell. This PC also formed part of the PhD student's work.

Another intervention undertaken in the coffee value chain was to link coffee farmers to high end markets that offer better returns. There was need to test cost effective approaches to motivate farmers to engage in speciality market for coffee. The treatments included:

i) Training and Follow up: Farmers in IPs were trained in several social skills to improve their interactions including (a) Group dynamics and team development, Communication, Leadership, Networking, Conflict management and Business plans (b) Technical skills: Quality of coffee – recommended harvesting and postharvest handling and (c) Regular follow ups for technical backstopping, encouragement, advise

ii) Economics experiments with coffee IPs: From the multi - stakeholder meetings, lack of trust was identified as a key issue requiring capacity strengthening in order to enhance the functioning of IPs. Economic experiments were therefore conducted among 300 coffee stakeholders in Kapchorwa district (mainly growers and traders) and the games included (a) Trust (investment) game: to measure trust/trustworthiness (b) Dictator game: altruism and (c) Risk game: to assess risk preferences of the various stakeholders. A total of 11 sessions – 6 sessions for growers and traders (12 persons each) and 5 sessions for only growers (3 sets of 24 and two sets of 36 growers) were undertaken in Kapchorwa district.

iii) Surveys with coffee growers and pickers: A baseline survey of coffee growers was conducted between July – August 2018 involving 600 households in two selected coffee IPs. This consisted of 300 household heads and another 300 spouses. In addition, 500 spouses of coffee growing households under KAWACOM were taken as the control. A Picker survey of 300 coffee pickers was also done in September 2018. Its aim was to:

- Assess contractual arrangements between growers and pickers of coffee from the perspective of coffee pickers.
- Generate an understanding of time allocations of and payments to coffee pickers,
- Determine how increases in labour time allocated to coffee picking impact on other activities (e.g. child rearing), and
- Allow regular follow-up through phone-based questions on payments made by growers to labourers.

iv) Coffee Picker experiment/training: In this experiment, 102 coffee pickers were involved in small groups of 6-10 people. The experiment aimed at identifying the most appropriate mix of incentives that could work best in encouraging coffee growers/producers to provide the right quality and quantity of coffee cherries. The project team identified ripe coffee gardens, negotiated with the grower and trained on good coffee picking and grower compensations. Growers were then stratified among 2 treatments (A - no information provided and B - information provided) under 4 contracts 1, 2, 3 and 4 (**Figure 5**).

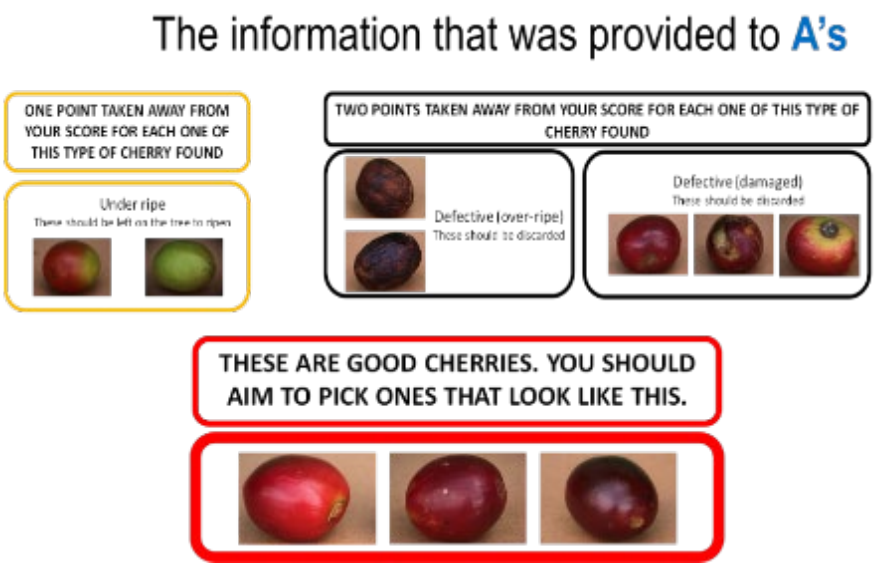

Figure 5: Information provided to coffee pickers on quality cherries

For all the experiments, the following four contracts/treatments were administered to the different farmers in category A and B: these treatments were later tested to see their effects on farmer behaviour in picking of quality coffee (**Table 1**). The research team assessed the quality of the coffee cherries picked and rewarded the pickers accordingly (**Figure 6**).

Table 1: The four treatments/contracts to coffee farmers under categories A and B

Contract	Payments under different treatments	
	A (No information given)	**A (Information given)**
Contract 1	UGX 3,000 (unconditional payment whether passed or failed)	UGX 3,000 (unconditional payment whether passed or failed)
Contract 2	UGX 4,000 unconditional payment	UGX 4,000 unconditional payment
Contract 3	UGX 4,000 for quality pass and 2,000for quality fail	UGX 4,000 for quality pass and 2,000for quality fail
Contract 4	UGX 5,000 for quality pass and 2,000for quality fail	UGX 5,000 for quality pass and 2,000for quality fail

Figure 6: Research team assessing the quality of coffee cherries harvested by different pickers

5.9 Coffee growers' diaries

The coffee diaries were aimed at capturing incomes from coffee and how the income received from sale of coffee contributed to the livelihood of coffee growers and pickers.

The objectives of the coffee diaries were to:

- Identify drivers of low savings
- Identify behaviours associated with high and low savings
- Test theories regarding unconditional transfers (using the random reward incentivisation scheme)
- Test theories about consumption patterns which create poverty traps
- Identify nutritional deficiencies, and
- Describe the dynamics of relationships between income, savings, nutrition, credit, expenditures, etc.

Dynamics of savings, expenditure and nutrition covered the following aspects:

- Weekly diary (filled by the growers and pickers with the help of enumerators)
- Tally and image based: Allows completion by people with low literacy and numeracy levels
- Income (across multiple sources)
- Savings, credit, transfers

- Expenditures (across multiple sources)
- Nutritional tally (what foods eaten on daily basis)

The diaries (**Figure 7**) were kept by up to 500 households- 250 pickers and 250 growers, for the first 6 months between 25th Oct 2018 – 25th April 2019. Afterwards only 200 households -100 pickers and 100 growers kept the diaries for another 6 months (26th April to Oct 2019). In each month, 10% of households with well-kept coffee diaries were randomly picked and rewarded with small amount of money of UGX 30,000 ≈ 8 USD.

Figure 7: A sample of a Coffee growers' diary

Some Stages in coffee production at Mt Elgon Women in Speciality Coffee IP, Kapchowra

6 Achievements against activities and outputs/milestones

Objective 1: To assess smallholder livelihoods, institutional arrangements across scales, and identify drivers that enable value chain IP development for sustainable agriculture commercialisation.

No.	Activity	Outputs/ Milestones	Due date of output	Comments
1.1	Smallholder livelihood analysis	Situational analysis	Yr1 M9	Inception workshops were held in 2015 in Zambia and Uganda to create awareness among stakeholders of the VIP4FS project, get their buy-in and identify relevant stakeholders and map their potential roles in the project (inception workshop reports). Scoping studies were undertaken in October and November 2015 in Zambia and Uganda respectively to understand farmers' livelihood strategies including potential value chains for development Baseline survey conducted in 2017 over 607 and 427 households in Uganda and Zambia, respectively complemented the scoping study findings and provided quantitative insights into the livelihood strategies of farmers in the study sites at the start of the project. See reports on Livelihood Analysis_Solwezi Zambia and Livelihood Analysis_Uganda.
1.2	Comparative analysis of rural institutions across project sites	Systematic review of approaches to value chain IP development in Africa.	Yr1 M6	Guidelines for literature reviews were developed and shared amongst partners. Desktop review was undertaken, and a document developed.
		Variables for cross sites institutional analysis defined and report produced.	Yr1 M9	Based on the scoping exercise, site level focus group meetings with various stakeholders were undertaken and a conceptual framework developed highlighting variables for cross site institutional analysis.
		Spatial correlation in household choices across levels of aggregation analysed and maps produced.	Yr1 M12	Survey protocols were developed for the 3 sites. Geo-referenced data collected in April and May 2016 in Zambia and Uganda.
		Report on social networks.	Yr1 M12	This was undertaken as part of MSc students work in Zambia and Uganda. The study in Uganda focused on understanding how innovation platform networks enhance smallholder producers' participation in coffee marketing. MSc thesis and a manuscript are being developed on networks. A report has been summarized in two pages.

No.	Activity	Outputs/ Milestones	Due date of output	Comments
1.3	Characterize rural institutional development across multiple scales	Drivers of institutional strengthening identified and characterised	Yr2 M3	Drivers of institutional strengthening were identified through i) livelihood analysis work in Uganda and Zambia ii) Multi-stakeholder workshops in Uganda and Zambia. The work involved close collaborations between work package 1 and 2 with the following main activities: i) The re-calibration of the RIDS software to conform with the local contexts of Manafwa, Kapchorwa and Solwezi ii) Focus group discussion in Uganda and Zambia, iii) Carrying out a general farmer groups census in the 3 sites based on a re-calibrated farmer group capacity needs analysis protocol (copy of protocol), iv) An analysis of the rural institutional capacity needs, v) Based on emerging results from the institutional capacity needs analysis, a training needs report was developed. The rural institutional capacity needs results as well as the outputs from a spatial analysis study undertaken provided an indication of the development strategies needed for enhancing the role of grassroots institutions in development. The strategies provided an insight into technology uptake, institutional arrangements necessary to provide for opportunities and incentives. Several stakeholder engagements and communications have been undertaken including formation of IPs in Zambia and were majorly used as a platform to communicate planned comparisons as a methodology to address problems and opportunities farmers were facing. Stakeholder engagement was also used as an avenue to promote the formation of innovation platforms. A report found on link: https://www.dropbox.com/s/wucuqcslchnri8v/2018%20VIP4FS%20Stakeholder%20Engagement%20Meetings%20Report.docx?dl=0. The stakeholders were also trained on Innovation platforms concept and this resulted in the formation of three (3) Innovation Platforms for Solwezi district including St Francis and Mutanda farming blocks and the district level IP at Solwezi. In Uganda, several stakeholders at the district level were also engaged such as the district local government, involving both members from the political and technical wings. Several IPs were formed for coffee, dairy and honey valve chains.

No.	Activity	Outputs/ Milestones	Due date of output	Comments
		Rural institutional capacity needs identified, and development strategies defined	Yr2 M9	The project team monitored the IPs to provide technical advice, remind them about the functioning of IPs, encourage them to overcome any constraints and move on and attract additional support from any strategic partner willing to work with the IPs. https://www.dropbox.com/s/bv06ijqk82c946y/REPORT_STAKEHOLDER%20%20%20%20%20ENGAGEMENT-PLANNED%20COMPARISONS_MANAFWA%20AND%20KAPCHORWA.pdf?dl=0 In Uganda, IPs were engaged in various training sessions that were intended at improving their group dynamics and team development in both social and technical skills. Under the social skills, the training content covered group dynamics and the role of a facilitator, team development, leadership and introduction to business planning. IPs were also trained on leadership and technical aspects depending on the commodity of focus. The coffee IPs were trained on identification and management of common pests and diseases; dairy IPs were trained on basic management of a dairy cow; and the honey IPs were trained in basic bee keeping practices including; sitting a bee hive, characteristics of a good hive, bee forage, bee pests and diseases and hive management for increased honey yields and income generation. Trainings aimed at assisting IPs and member groups to identify any gaps that existed among the members and come up with strategies to make the IPs and the groups stronger, more functional and accountable to each other, and to other partners they worked with in all aspects.
		Report on the benefits of institutional strengthening on performance of IPs	Yr3 M12	Institutional strengthening needs for IPs were identified earlier in the project and were involved in several activities in the different value chains as part of institutional strengthening. These included improved functioning of IPs and profitability of different value chain enterprises. The benefits of these interventions are contained in several reports. Three IPs were fully established and operationalized in Solwezi in September 2018 at Mutanda, St Francis and Solwezi and the capacity of IPs was built in collaboration with Solwezi District Livestock Department. Two IPs in Zambia (St Francis and Mutanda) have been formally registered as co-operatives and they are looking at issues beyond the three value chains of interest such as fish farming and value addition. St Francis IP submitted a funding proposal to FARA for an integrated project on village chicken and aquaculture while Mutanda IP submitted a proposal to IDE. IPs in Uganda are now working on being registered as community-based organisations so that they can assess additional funds from government development programs and other development partners.
1.4	Facilitate rural institutional visioning and partnership identification in support of an enabling environment for rural	Community vision maps produced Potential private sector actors identified through stakeholder maps	Yr1 M9 Yr1 M12	A series of multi-stakeholder workshops were undertaken based on select value chains in June 2016 in Zambia and Uganda and community value chain maps were developed. Stakeholder mapping was undertaken through multi-stakeholder workshops. Value chain clusters formed, and action plans developed. Action plans per value chain clusters were documented. The project team engaged Manafwa and Kapchorwa district local governments and agreed that IPs need to be facilitated to be registered as community-based organisations that can attract the additional resources from government and other actors to implement their plans and become sustainable. The team also engaged with key coffee stakeholders at national level (NUCAFE, Kawacom, UCDA, OLAM) and international level (Monastery coffee, Intersection Traders). In Solwezi, the project team established collaboration with local chicken buyers, district and provincial governments and NGOs to establish mechanisms for development of the three value chains. In Solwezi, Three IPs in Solwezi were fully established

No.	Activity	Outputs/ Milestones	Due date of output	Comments
	enterprise and market development	Institutional instruments/mechanisms necessary to provide a conducive enabling environment identified across different scales	Yr3 M6	and operationalized in September 2018 at Mutanda, St Francis and Solwezi and the capacity of IPs was built in collaboration with Solwezi District Livestock Department and one of the IPs submitted a funding proposal to FARA for consideration. Linkage to markets was identified in both Uganda and Zambia as a critical institutional mechanism necessary to provide a conducive enabling environment across different scales for the coffee and village chicken value chains. More efforts were therefore dedicated to building the capacity of IPs in creating markets, especially by producing speciality coffee in Uganda and rearing local (village) chickens in large quantities in Zambia. The other mechanism was institutionalization of IPs to be able to secure business deals with both local (village chicken) and international (coffee) buyers.
1.5	Identify institutional drivers and trade-offs for market intensification	Institutional drivers of market intensification identified, and reports produced Trade-offs identified in integrating ecosystem goals with market development and report produced	Yr3 M6 – Yr 4 M9 Yr3 M6 – Yr 4 M9	Under the coffee value chain, quality coffee picking was identified as a key driver for market intensification and to achieve this a training manual on picking of quality coffee was developed. Twenty-one extension staff of Kawacom (the buyer) were trained by NUCAFE (with help of laminated pictures – visual aid). Recorded voice calls (robocalls) through SMS ONE (U) LTD were also made to 450 selected households to remind farmers to pick only the red ripe cherries during the harvest season. For the village chicken value chain, institutional drivers of market intensification were identified through farmer-trader linkages which created buy-in for participation of traders in PCs and a need to build their capacity in improved marketing of village chicken. The market potential of village chicken in Solwezi was determined through restaurants and hotels survey and a report was produced. Trade off identified in the three value chains and results presented in two-page summaries developed during the project write shop held in Nairobi in 2019.

Objective 2: To identify best fit value chain development strategies and market information delivery systems and examine their influence on the success value chain innovation platforms in enhancing rural enterprise development.

No.	Activity	Outputs/ Milestones	Due date of output	
2.1	Conduct stakeholder workshops to develop a conceptual framework to examine market information delivery systems	Conceptual framework for market information delivery systems developed	Yr1 M9	Literature review and stakeholder workshops were conducted in both Uganda and Zambia to understand the different contexts in which the project was operating. This enabled the development of a conceptual framework which was used to examine market delivery system for coffee and village chicken value chains in Uganda and Zambia, respectively.

	across farm, landscape and district level in learning IP sites			
2.2	Conduct surveys to identify potential value chains, value chain upgrading strategies, market characteristics and attributes of market information delivery systems in IP learning sites	Value chains and market characteristics and linkages with existing institutions identified including assessment of associated risks. Key attributes of market information delivery systems for successful value chains, as well as opportunities for local enterprise development identified and described.	Yr1 M12 Yr1 M12	Comprehensive literature review was undertaken to identify potential value chains and actors along the value chains. Characterisation of production systems and market structures in Solwezi, Kapchorwa and Manafwa was done through a scoping study (linked to 1.1). Criteria for selecting potential value chains was developed and 3 values chains were identified for each site, namely Solwezi beans, soya beans and local chicken for Solwezi district in Zambia and coffee, dairy and honey for Kapchorwa and Manafwa in Uganda. Under the same study, context specific key attributes of market information delivery system were identified. Quantitative data analysis to identify strategies for strengthening/developing the selected value chains was undertaken and documented.
2.3	Analyse value chain development strategies to identify best fit scenarios to support sustainable commercialization for local enterprise development through IPs in learning sites	Best fit value chain development strategies identified	Y2 M6	Strategies for developing the six value chains namely, coffee, dairy and honey in Manafwa and Kapchorwa; and Solwezi beans, Soya beans and village chicken in Solwezi were identified and outlined in a report titled strategies for developing value chains in Manafwa, Kapchorwa and Solwezi.
		IP models for commercialization of smallholder agriculture developed	Yr2 M9 (Kap) Yr3 M3 (Man) Yr3 M9 (Sol)	Three potential IP models for commercializing smallholder agriculture were identified and tested for cost effectiveness using planned comparisons approach. The three models were:(i) Linkage with private sector actors (ii) Co-financing of critical inputs for commercialisation and (iii) Boosting productivity to secure reliable high-end markets The dairy and chicken planned comparisons were fully implemented and end line surveys were also conducted in both Uganda and Zambia. The results have been summarized and included in the final report. PhD and MSc students are also using part of the end line data for their theses. A number of publications have also been developed under this milestone and are also summarized in a two-page briefs about the project
		Report on strategies proposed for empowering women	Y2 M6	Deliberate efforts were made by the project team to improve women's participation in the value chains selected for development, including: Value chains dominated by women were prioritised for further development and 50% quota was preserved for women in the planned comparisons to ensure that they participated in the trainings and other interventions such as linkage with buyers in the coffee and village chicken value chains. In Uganda 18 women out of 28 citizen scientists were randomly selected under the dairy PCs in Kapchorwa and Manafwa. The trainings and demonstrations on soya beans and Solwezi beans targeted women farmers.

				The coffee value chain engaged two all women IPs (Mt Elgon women in Coffee IP and Chema IP) to produce specialty coffee which has been exported to Monastery coffee roasting company in Australia. The two IPs were supported to develop business plans and linked to credit providers for loans (e.g. Sebei SACCO and Centenary Bank) to be used to purchase coffee drying trays and mini washing stations. Mt. Elgon women in Speciality Coffee IP was supported with a coffee pulping machine and a moisture meter. In Zambia, village chicken is "women dominated value chain" and the interventions aimed at incentivising farmers to commercialise village chicken rearing had a target of 50% of the participants being women. Intervention mainly targeted mass production, vaccination and sale of village chicken. Two publications have been developed focussing of strategies for empowering women in selected value chains (Odoul et al and Kimaiyo et al)
		Report on achievements on institutional strengthening and value chain development through IPs	Y2 M9 Y3 M9	Documentation of processes undertaken to strengthen institutions was undertaken in both countries and three selected value chains were developed through IPs in both Uganda and Zambia. Training content on IPs strengthening in both Uganda and Zambia and Initial reports of IP formation in Zambia were produced. Earlier engagements with IPs revealed that IPs had a number of challenges relating to institutional strengthening and value chain development, including; lack of trust, inappropriate dairy feeding, poor quality coffee, insecurity of beehives sited in the forest, and lack of linkage between village chicken producers and traders. Three economic experiments (trust games) were designed and conducted in Uganda (August – Sep 2018) among 300 coffee growers and traders. Details of the experiments and capacity building are presented in the results and discussion section.
2.4	Develop models for private sector engagement in market and value chains development through multi-stakeholder processes	Initial models for private sector engagement defined	Yr2 M6 (Kap) Yr2 M6 (Man) Yr2 M6 (Sol)	Potential private sector stakeholders were identified and documented in the report entitled strategies for developing value chains in Manafwa, Kapchorwa and Solwezi. The SWOT analysis conducted during the multi-stakeholder meetings in Uganda and Zambia held in the three sites provided valuable information for identification of the models. Three models for engaging private sector actors were defined and tested through PCs for their effectiveness and further scaling up. Findings on effective models for engaging the private sector in value chain development have been synthesized and a publication developed Odoul et al.
		Report on progress on implementation of private sector engagement strategies at 3 sites	Y2 M9	In both countries, private sector actors were identified through stakeholder mapping and analysis, which was done during multi-stakeholder workshops held in October 2015 in Uganda and Zambia. The relevant private sector actors were engaged to get their buy-in into the proposed interventions before rolling them out. See reports on stakeholder engagement in this link

			Y3 M9	Zambia:https://www.dropbox.com/s/wucuqcslchnri8v/2018%20VIP4FS%20Stakeholder%20Engagement%20Meetings%20Report.docx?dl=0 Uganda:https://www.dropbox.com/s/bv06ijqk82c946y/REPORT_STAKEHOLDER%20%20%20%20%20ENGAGEMENT-PLANNED%20COMPARISONS_MANAFWA%20AND%20KAPCHORWA.pdf?dl=0 PCs have been the basis for private sector engagement. In Uganda, Monastery Coffee, Intersection Traders, NUCAFE and Kawacom were the key private sector actors while in Zambia, village chicken traders within Solwezi were involved in the planned comparison. Documentation of the progress on implementation of private sector engagement strategies was undertaken through simple tools that were developed to monitor progress and processes leading to successful engagement of the private sector actors. Reports on implementation and progress of the different PCs have been produced and shared (village chicken, dairy). See Isubikalu et al 2018 for progress on implementation of strategies for engaging private sector actors in the coffee value.
		Models for private sector engagement for different contexts refined	Yr4 M12	The three models outlined under activity 2.4 were refined through PCs and findings of the models have been summarised in two-page documents (coffee-Kawacom, Coffee_Monastry, village chicken).

Objective 3: To develop and evaluate scalable approaches for promoting value chain innovation platforms among smallholders and other stakeholders in ways that generate inclusive and sustainable economic benefits.

No.	Activity	Outputs/ Milestones	Due date of output	
3.1	Inventory, assess, and select value chain initiatives and opportunities in impact evaluation sites, which are conducive for the meaningful participation of women and other disadvantaged groups.	Inventory and scoping report of VC sites VC field report with IE indicators Report to inform IP facilitation.	Yr1 M8 Yr1 M10 Yr1 M10 Y2 M9	Study sites were characterised through scoping studies and baseline surveys and reports produced Based on the work of WP1 & WP2 in Year 1, several strategies for developing the six selected value chains were identified and contextually appropriate strategies prioritised for implementation through planned comparisons. Work was undertaken to identify Innovation Platforms (IPs) for each of these value chains, where they were engaged in a strategic visioning and planning exercise. The project's impact evaluation work focused on supporting the design and testing of innovative approaches to support the IPs and in-country partners overcome challenges related to the development of the selected value chains and estimating the ensuing outcomes and impacts. To support the country team's work with the IPs, Year's 2 work involved the development of a planned comparison guidance document (Hughes and Oduol 2017), complemented with training and co-planning with project and country teams (reports). This resulted in the identification of six planned comparison concepts, three of which were developed into full planned comparison protocols.
		Report on women's empowerment activities	Y4 M9	The project teams in both countries engaged women in IPs and value chains. In Kapchorwa, women IPs have been involved in production of specialty coffee for export to Australia and so far, 4.5 tons of coffee cherries was bought from farmers which translated to 1.1 tons of dry coffee beans which was shipped for auction. More coffee buying was undertaken in 2019 and quantities were expected to be much higher. In Manafwa and Kapchorwa, women have been involved as citizen scientists under the dairy PC and leading activities under landcare. The coffee picker experiment also had a greater involvement of women. In Solwezi, the project team undertook a demonstration on value addition to soybeans with mothers at a local clinic at St Francis. The village chicken as well as soybean and Solwezi beans interventions have deliberately targeted women. An article on women participation in the different value chains in Uganda and Zambia reported under 2.3 also captures of women empowerment activities.

No.	Activity	Outputs/ Milestones	Due date of output	
3.2	Devise strategic, gender-responsive interventions to address key challenges affecting progress of IP-lead value chains, including means of testing their (cost) effectiveness	At least 3 planned comparison protocols	Yr2 M6	Three planned comparisons were developed (dairy and coffee in Uganda, and village chicken in Zambia). Dairy PC and Village chicken protocols are found on the links: Dairy, coffee and Village chicken. For all the three value chains, baseline surveys were undertaken in 2017, and implementation done between July 2018 and February 2019. Various trainings were conducted as specified in the PC protocols. Report on the training can be found on below link: https://www.dropbox.com/s/k1qabdsizq929a0/2018_VIP4FS_Trainer%20of%20Trainers%20Workshop_Solwezi.docx?dl=0 several trainings manuals for the three planned comparisons were developed: Dairy:https://www.dropbox.com/s/m8d2ng73yhblfke/Information%20DAIRY%20PC%20Manual_CT_21April2018_JS.docx?dl=0 Local chicken: https://www.dropbox.com/s/mdm3o2nmbx37h7k/2018%20Marketing%20Village%20Chicken%20Training%20Manual%20-%20Revised%20Version.docx?dl=0 Protocols for data collected can be found in the following links: https://www.dropbox.com/s/jm81d14rx1elz2l/baseline_tool_coffee.pdf?dl=0 and protocol finalized https://www.dropbox.com/s/jm81d14rx1elz2l/baseline_tool_coffee.pdf?dl=0
3.3	Conduct focused baseline studies in support of 3.1.	At least 3 focused planned comparison baseline reports	Yr2 M9	Baseline surveys on the selected value chains were conducted in Uganda and Zambia. In Uganda, survey was undertaken in Kapchorwa and Manafwa covering over 1,300 dairy households in four major dairy sub-counties of Namabya, Mukoto (Manafwa), Kapchesombe and Tegeres (Kapchorwa). The aim was to generate insights into the status of feed, feeding and dairy management in the study sites with intention of identifying entry point within which to improve the dairy (milk production) enterprise among small holder farmers. In Solwezi, a baseline survey was conducted over 960 farmers in St. Francis and Mutanda blocks to better understand the status quo of production and marketing practices of farmers in the village chicken value chain. The baseline survey laid the foundation for developing interventions for the village chicken value chain. Details of PCs are presented in the results section.
3.4	Spearhead and monitor delivery of interventions devised in 3.1.	At least 3 intervention implementation reports (as part of final planned comparison reports)	Y4 M12	Implementation reports for dairy, coffee and village chicken value chains were produced. They are also summarised in the methodology and results sections.

No.	Activity	Outputs/ Milestones	Due date of output	
3.5	Conduct final end line surveys and complementary mixed-methods research to evidence the (cost) effectiveness interventions implemented and wider potential impacts on supporting the development of the targeted value chains.	At least 3 planned comparison reports, with differential impacts on male/female and different categories of value chain actors evaluated.	Yr4 M 12	End line surveys were undertaken between February and August 2019 on coffee, dairy and village chicken planned comparison farmers. Data analysis has been completed and findings summarised in two-page documents and two manuscripts. Lessons from the dairy planned comparison informed the design of a proposal, which has been funded by the GIZ. Manuscripts have also been developed by PhD students on coffee and village chicken (Cansin and Moffat)

Objective 4. To engage with and strengthen the capacity of key stakeholder groups to both enhance the research process and promote the widespread scaling up of approaches generated by the project.

No.	Activity	Outputs/ Milestones	Due date of output	Comments
4.1	Country and project level stakeholder mapping and initial capacity needs assessments	Capacity Development, Research Scaling, and Communication Strategy developed	Yr4 M3	During the process of identification of the six value chains, project and country level stakeholders were identified. They were brought together in each project site where they developed value chain maps, visions, strategies and action plans for each of the targeted value chains, as well as key challenges, constraints and capacity development needs. Capacity needs for research scaling were earlier identified and several activities have been undertaken to enhance the capacity of country teams in PC implementation. The use of PCs is a significant shift towards involving many farmers in implementing different options under varying contexts. Use of citizen scientists to share results and experiences through local dissemination sessions as outlined in the project communication strategy was critical in facilitating information dissemination and adoption of

No.	Activity	Outputs/ Milestones	Due date of output	Comments
				improved practices. Implementing partners in both Uganda and Zambia have built capacity in use of PCs and have mainstreamed PCs in their research and development work.
4.2	Initial partner and 'scaling stakeholder' engagement	Portfolio of key 'scaling stakeholders' effectively engaged with and have ownership over the project	Yr4 M6	In addition to the project country partners and targeted value chain actors, Key stakeholders were identified and engaged at different levels for scaling and creating project ownership: (i) local governments- to integrate value chains and IP approach into government programs (ii) Uganda Coffee Development Authority (UCDA) -for capacity building, provision of quality planting materials and quality control; National Union of Coffee Agribusinesses and Farm Enterprises (NUCAFE), for capacity building, access to lucrative coffee markets & advocating for better prices; Coffee traders/exporters- for linkages into existing extension and marketing systems; International coffee companies (e.g. Monastery coffee and Intersection Traders) to link IPs to international markets; Uganda National Apiculture Development Organisation (TUNADO) – to provide a national platform for developing the honey value chain (vii) Milk buyers and processors – to provide market for milk (vii) Agrovet service providers – to support farmers in accessing improved dairy breads, egg incubators, control of pests and diseases including poultry vaccination (viii) Village chicken traders and end users (hotels, lodges and restaurants) – to provide regular market for village chicken to facilitate scaling out. Zambian Ministry of Agriculture and Livestock, the Zambian Farmers Union, World Vision, International Development Enterprise (IDE) in Zambia During the last year of the project, the team engaged several stakeholders in Uganda and Zambia to mainstream key results from the project and develop further collaborative arrangements. ICRAF, NaFORRI, Makerere University and University of Adelaide have developed partnership arrangements with NUCAFE, National Coffee Resources Research Institute (NaCORRI), and UCD for continuation and expansion of the speciality coffee initiative in Uganda. ICRAF and NaFORRI are exploring opportunities to work on the smallholder timber and fruit production in Uganda using similar approaches. The IP model is being taken up in Zambia for large scale production of village chicken, beans and soy. The project team will continue to disseminate project findings in both countries including lessons learnt, tools and guides developed.
4.3	Training, mentoring, and action learning for local and national institutions and other stakeholders	Partnering research & local gov. institutions trained in field work and value chain analysis	Yr2 M6	Partnering research and local government staff have been trained in the use of ODK, RIDS tool and value chain analysis. All partners were also trained in developing and implementing planned comparison protocols. Partnering research and local government institutions in both Zambia and Uganda were trained on landcare principles and practices during the 2nd and 3rd years of project. In Oct 2019, partners were trained in developing dissemination products based on project findings.
		Tailored and gender appropriate business planning and marketing training for supported farmer groups	Yr2 M6	Business planning and marketing training was undertaken for the two flagship value chains - village chicken in Zambia and coffee in Uganda. The IPs developed their draft business plans indicating production and marketing targets as well as the desired partnerships and additional required capacity

No.	Activity	Outputs/ Milestones	Due date of output	Comments
				building. The project team has continuously undertaken additional capacity building and linking of IPs to viable markets. Reports and numbers trained are reported in other sections.
		Three to four doctoral study fellows and 4-6 Masters students recruited in Uganda and Zambia	Yr3 M6	The project has supported 12 students (4 PhD and 8 MSc). Students undertook their field research in Uganda and Zambia while some MSc students were supported in literature review at the start of the project. The students were enrolled in the following universities: Copperbelt University, Zambia, Bangor university, UK, Wageningen University, Göttingen university and Makerere University, Uganda. Details of students is presented in Appendix 1. Students' work has started to generate research publications in addition to theses. This work is expected to generate several research publications under the guidance of the project team.
		Over 200 existing and new IP participants trained and mentored through action learning	Yr2 M6	Action learning training and mentoring in both Uganda and Zambia has covered aspects such as; effective functioning of IPs, production of village chicken, increasing yields of Solwezi beans and soybeans, production of speciality coffee, management of dairy cows and best bee keeping practices for increased honey production. Overall, over 4,950 smallholder farmers have been directly reached and influenced under the village chicken, Solwezi beans, soybeans, coffee, dairy and honey value chains. Out of these 1,900 were trained and mentored on specialty coffee production involving improved quality of coffee cherries and post handling processes. Training materials and manual were developed, and further trainings have continued under scaling up plans especially for farmers who were on waiting list/control category under the different PCs.
4.4	Periodic stakeholder engagement & research finding dissemination	Evidence updates & briefs Online videos & blogs Newspaper reports Televised news coverage Publications	Reviewed and reported annually by SC	Communication products regarding the project have been produced and disseminated with other stakeholders using different channels See appendix 11.2 The project team including students held a write shop in October 2019 where several communication products have been drafted and are under completion (see list of publications).

Objective 5. To systematically monitor and review project implementation and evaluate its outcomes and impacts.

No.	Activity	Outputs/ Milestones	Due date of output	Comments
5.1	Activity monitoring and output/milestone achievement tracking	Project progress reporting template & corresponding database	Yr1 M3	A project performance dashboard had been developed in year 1 and was operationalized in Year 2 however it's use was suspended as it could not track all the activities under PCs which were progressing at a different level in the two project countries. The project team came up with alternative strategies for output/milestone tracking for instance each work package was analyzed and outputs for the year were divided into progress markers to ensure better reporting by work package leaders, country coordinators and project manager.
		M&E plan against AIFRSC M&E strategy Project reports submitted to PM every quarter	Yr1 M6 Quarterly	The project team developed M&E plan. The purpose of VIP4FS M&E plan was two-fold: To support (a) the regular review and strengthening of the project's theory of change and (b) progress reporting to ACIAR against its planned outputs and relevant intermediate development outcomes (IDOs) from the Australian International Food Security Research Centre (FSC). The M&E Plan is available through the link: https://www.dropbox.com/s/vbvkrd4kihwfyxe/ME%20Plan%20VIP4FS_post%20review_refreshed.docx?dl=0 The project reports were always submitted to the project manager quarterly as updates of progress.
5.2	Bi-annual Steering Committee progress review meetings	Steering Committee set up Bi-annual Steering Committee meetings	Yr1 M4 Bi-annually	The projects steering committee was set up and several steering committee meetings were held. Meetings were always held based on the availability of the key project personnel including the ACIAR project manager, ACIAR Regional Manager and ICRAF scientific advisor. Due to scheduling changes, annual instead of bi-annual meetings were held. Four meetings were held covering 4 project years: 2016, 2017, 2018 and 2019. Though it had been recommended that the SC meetings could be rotated to project sites in Uganda and Zambia, all of them were held in Nairobi given its centrality to the project partners, ease of travel and cost implications. All partners participated in these meeting. The University of Adelaide and ACIAR teams participated via WebEx for some sessions of the meetings. All steering committee meeting reports are available.
5.3	Project mid-term review	Mid-term review workshop held Mid-term review workshop report produced	Yr2 M10 Yr2 M12	The mid-term review was held from 13-17 November 2017 with field visits and stakeholder meetings in Kapchorwa (Uganda) and Solwezi (Zambia). The ACIAR manager at the time (Tony), provided comments on issues which needed ICRAF's response and these were addressed. The project mid-term review reports for Uganda and Zambia were produced and shared with project partners. Mid-term review reports by the project teams in Zambia and Uganda are available through this link:

No.	Activity	Outputs/ Milestones	Due date of output	Comments
				http://www.worldagroforestry.org/output/proceedings-vip4fs-project-mid-term-review-solwezi-district-zambia http://www.worldagroforestry.org/output/proceedings-vip4fs-project-mid-term-review-kapchorwa-and-manafwa-districts-uganda
5.4	Project final evaluation	Independent evaluator engaged Draft evaluation report circulated Final evaluation report submitted	Yr4 M6 Yr4 M10 Yr4 M12	Two independent evaluators were engaged by ACIAR Forestry Project Manager. Independent evaluation of the project was undertaken from 28th October to 6th Nov covering both Zambia and Uganda. Draft evaluation report was shared project team provided inputs. The final evaluation report has not been shared.

7 Key results and discussion

Smallholder livelihoods, institutional arrangements and drivers for IP development

Livelihood analysis

At the beginning of the project, the project team undertook livelihood analysis of the different farmers in the different project sites in Uganda and Zambia. The livelihood analysis aimed at providing an understanding of the context in which smallholder farmers operate in order to be able to propose interventions that will improve food security and enhance their livelihoods. The analysis focussed on household, asset ownership, institutions found in the area as well as agricultural production.

In Solwezi district, most farmers were engaged in crop production of majorly Maize (98%), Solwezi beans (64%) and local chicken as the main livestock type kept by farmers (91%) most of which were kept in free range. Farmers only cultivated 43% of the land owned in Solwezi with an average of 1.52ha under cultivation. Most of the households (97%) belonged to groups. Households joined farmer groups to access benefits from implementing organisations or government (52.1%) and to generate income for their households (24.1%).

Farmers in both Manafwa and Kapchorwa districts, were engaged in production of maize (86%), beans (82%), Bananas (62%) and coffee (56%). In terms of livestock production, most farmers owned an average of 2 livestock with local chicken and dairy farming topping the list. About 29.7% and 54.8% of farmers in Manafwa and Kapchorwa respectively owned dairy cattle within the agricultural year 2015. For participation in group membership, only 22.5% and 31.2% of farmers in Manafwa and Kapchorwa belonged to groups. These groups were usually formed voluntarily by farmers themselves as compared to those in Solwezi which were a mandatory for farmers to join a group to receive inputs from Ministry of Agriculture.

The type of formation of these groups hampered their levels of commitment and the interventions that could be undertaken in the innovation platforms. As earlier highlighted groups in the different districts have different starting point depending on their levels of maturity. In Solwezi for instance an analysis of the governance structure of the groups showed that most farmer groups were in the beginner stages.

A farmer groups survey in all project sites aimed to assess and determine farmer groups maturity levels. Levels of maturity were determined using a software developed by ICRAF project previously, the Rural Institutions Diagnostic Survey (RIDS), that aimed to provide a simple process for determining the initial maturity status and subsequent progress of rural institutions capacities. RIDS evaluated smallholder farmer groups' advancement processes and mapped observed changes around pre-defined standard principles and several criteria and an index for the maturity of groups as a surrogate measure of their performance (Kimaiyo et al 2017).

Using RIDS, farmers in all districts were categorized into 3: Mature, Novice and Beginner. In all districts most farmer groups fell into the intermediate category with only a few falling in mature and novice categories. On the different structural governance, most of the mature farmer groups were formally registered, had a bank account and had an office compared to intermediate and beginners' groups in Manafwa and Kapchorwa and Solwezi (**Figure 8 and 9**).

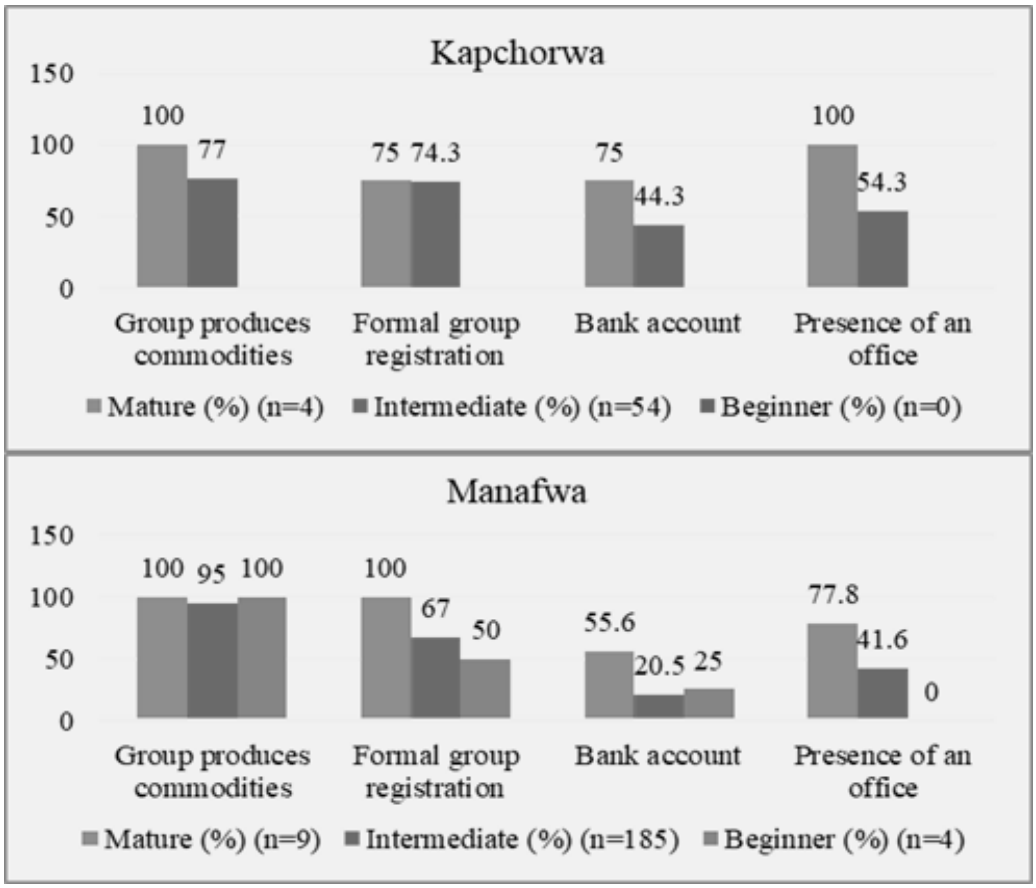

Figure 8. Farmer group characteristics in Kapchorwa and Manafwa, Uganda

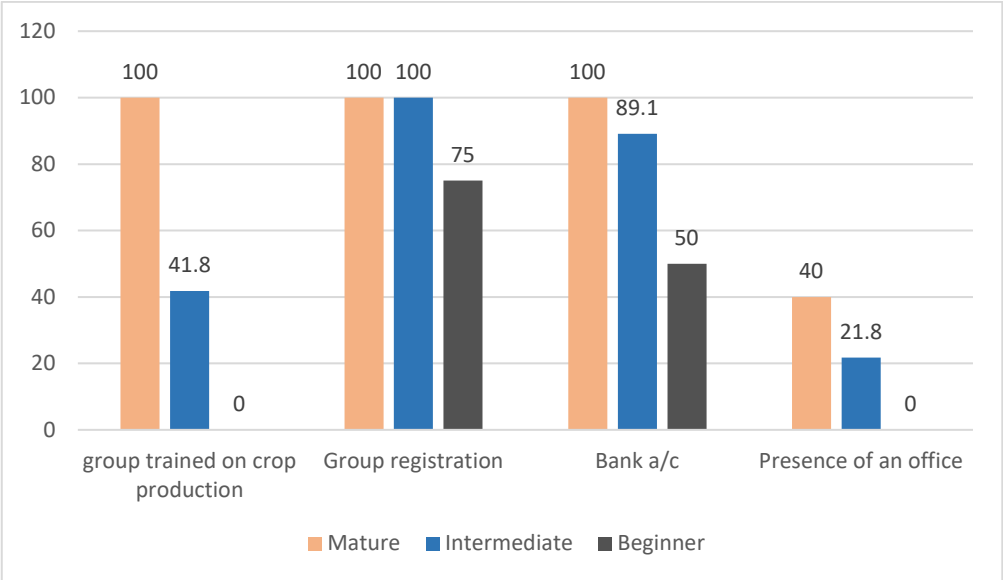

Figure 9. Farmer group characteristics in Solwezi, Zambia

Farmer groups survey

A farmer groups survey undertaken in 2016 in all the three districts helped to identify capacity gaps that existed in farmer groups and interventions for strengthening them. The analysis focused on production challenges within farming systems, access to markets, value addition and general group development. The training needs of farmer groups in Manafwa and Kapchorwa (**Table 2**) did not differ as they faced similar challenges in most aspects and therefore the interventions were also

similar. The gaps identified for farmer groups in Solwezi (**Table 3**) related more to production and group development**.**

Table 2. Training needs of farmer groups in Manafwa and Kapchorwa districts, Uganda

Production	Marketing	Value addition	Group development
• Pests and diseases identification and treatments • Fodder and pasture production for improved milk and honey production • Training on apiary management • Post-harvest handling of coffee • Management of dairy cattle • Soil conservation • Improved coffee production	• Partnership development with input dealers and other input providers • Training on market identification • Negotiation skills of market prices • Packaging and branding of products produced • Quality controls to attract favourable markets	• Training on different forms of value addition of coffee, dairy and honey products • Use of traditional methods of value addition • Partnership building with buyers	• Good Leadership skills • Financial management • Record keeping • Membership roles in the groups • Group dynamics • Group management and sustainability • Partnership building and development • Business planning Work planning • Conflict resolution

Table 3. Training needs of farmer groups in Solwezi district, Zambia

Production	Marketing	Value addition	Group development
• Technical training in crop production and management • Poultry keeping and management especially in vaccinations • Soil testing and the management of soil acidity • Provision and knowledge of where to obtain certified seeds for Solwezi beans and soya beans • Partnership development with input dealers and other input providers	• Market identifications Negotiation skill on market prices • Product branding	• Training on different forms of value addition	• Leadership skills and succession • Membership roles in the groups • Record keeping • Financial management • Group dynamics • Group management and sustainability • Agribusiness (farming as a business) • Partnership building and development • Work planning • Conflict resolution

In comparison with Solwezi, farmer groups in these two districts in Uganda highlighted diverse gaps that needed interventions. Most of the gaps identified by the Solwezi groups were on production and group development. This was an indicator that farmer groups in Manafwa and Kapchorwa were more advanced than those in Solwezi. Even though structural and governance gaps were identified in Manafwa and Kapchorwa, they also had visions for improving productivity, access to markets and value addition.

Innovation Platforms

The project team established innovation platforms (IPs) in three districts in the two countries. The IPs were formed differently depending on the context of the farmer groups found in the different districts. In Uganda for instance, the IPs were formed at lower administrative levels mainly consisting of farmers and service providers at village and parish levels with limited representation from the district (**Table 4**). The IPs were an aggregation of different stakeholders relevant to the objectives and purpose of IPs. Each IP in Uganda had an average of 35 members (including all actors in the value chain). The number of farmer groups represented in each IP range from 4 to 10 drawn from a wider geographical area consisting of 4 - 8 villages.

In Zambia, three IPs (**Table 4**) were formed consisting two lower level IPs in St Francis and Mutanda agricultural blocks and a third higher level IP at Solwezi district level. The lower level IPs in Zambia consisted of farmer representatives, agricultural extension officers in block and camp levels, and service providers such as agrovet owners and traders. The high-level IP was made up of provincial and district level agricultural staff, NGOs and traders and it focused on technical guidance of lower IPs and policy issues.

Table 4. IPs established under VIP4FS project in Uganda and Zambia

Value Chain	Kapchorwa District, Uganda	Manafwa District, Uganda
Coffee (15 IPs)	• Mt. Elgon Women in Coffee • Kabeywa • Kapsinda • Arokwo/Makakasi • Chema • Gamogo/Katongo • Tegeres	• Mukoto • Bumbo • Bukhoho • Bukusu • Busulya • Butta • Bughobero • Khabutoola
Dairy (6 IPs)	• Tegeres • Kokwomuria • Kapchesombe	• Mukoto • Magale • Namabya
Honey (5 IPs)	• Tegeres • Tekandet (Kwoti) • Tangwen Kwigaye (Kabeywa) • Sikako- women	• Mukoto
	Solwezi District, Zambia	
Village chicken (3 IPs)	**St. Francis (IP)** • Kisalala camp • Mwidishi camp • Ntamba camp • Kalomboshi camp • Kifita camp	**Mutanda (IP)** • Illunga camp • Mulimbi camp • Kawize camp • Kiboko camp • Lunsala camp
	Solwezi District IP (Higher level IP)	

Building capacity of innovation platforms

After identification of needs and capacities, farmer IPs were trained on various skills that aimed to improve their overall performance in terms of governance and skills for improved production of their selected value chains. Trainings aimed at assisting IPs and member groups to identify any gaps that existed among the members and come up with strategies to make the IPs and the groups stronger, more functional and accountable to each other, and to other partners they worked with in all aspects.

In Uganda, IPs were engaged in various training sessions that were intended at improving their group dynamics and team development in both social and technical skills. Under the social skills, the training content covered group dynamics, role of a facilitator, team development, leadership and introduction to business planning. IPs were also trained on various technical aspects depending on their commodity of focus, for instance; coffee IPs were trained on identification and management of common coffee pests and diseases; dairy IPs were trained on basic management of a dairy cow; and the honey IPs were trained in basic bee keeping practices including; sitting a bee hive, characteristics of a good hive, bee forage, bee pests and diseases and hive management for increased honey yields and income generation.

In Zambia on the other hand, IPs were trained on improved village chicken production and importance of market linkages. IPs also held other activities that were of interest to them, for instance; St Francis IP had a demonstration on value addition to soybeans for mothers at a local clinic. In addition, SAIRLA project helped address production and management of Solwezi and soya beans. At the beginning of the project, lack of pure Solwezi bean seed had been identified as a challenge. The two value chains however had an existing market but only required market linkages with potential markets like schools, hospitals and prisons. Given limitation in funding to undertake detailed studies on more than one value chain, research on developing pure seeds of Solwezi beans was not undertaken. However, the Zambia Agricultural Research Institute (ZARI) a key project partner, promised to include such a study in its institutional research plans.

Other complimentary IPs activities

The landcare masterclasses were held in Solwezi and Manafwa districts and farmer exchange visits for IP members from Manafwa where held as complimentary project activities. After the Landcare Masterclass training in Uganda, IP members from Manafwa participated in exchange visits to other IPs in Kapchorwa and Kamuli districts that had made good progress on the value chain development and sustainable land management. Specifically, the exchange visit helped Manafwa IP members to: (i) acquaint themselves with landcare and sustainable land management practices implemented by their counterparts in Kapchorwa and Kamuli districts (ii) draw lessons from the experiences of their counterparts in Kapchorwa on IP formation and strengthening, and (iii) get exposed to various innovative practices in dairy, honey and coffee value chains. At the end of the masterclass training and exchange visits in Uganda, the IPs from Manafwa resolved to improve their practices to conform with what they learnt. Among the suggested changes were fencing of land to keep off livestock, digging of trenches to control soil erosion and planting of trees in all farms. In addition, they also resolved to form Manafwa district Landcare Chapter.

Best fit value chain development strategies and market information delivery systems

Conceptual framework for market information delivery systems

In the development of IPs as well as the selected value chains, several stakeholder workshops were held in the different countries. In Uganda stakeholder meetings were held with Eastern Dairies in Mbale, Bugisu Dairies for dairy value chains, honey producers and traders in Kapchorwa. The project team also engaged Manafwa and Kapchorwa district local governments where the project team and district made plans to facilitate registration of IPs as community-based organisations (CBOs). This would give IPs an opportunity to apply and attract additional resources from government and other actors to implement their business plans. The project team also engaged with key coffee stakeholders at national level (NUCAFE, Kawacom, UCDA, OLAM) and international level (Monastery coffee, Intersection Traders) to facilitate the export of coffee from farmers in Kapchorwa to Australia. In Solwezi, the project team established collaboration with local chicken buyers, district and provincial governments and NGOs to establish mechanisms for development of the selected value chains. During the implementation of the village chicken value chain, the project team worked closely with Ministry of Livestock and Fisheries in Solwezi district given their expertise in this value chain.

The project team also held several multi-stakeholder meetings across project districts aimed at identifying to partner with as well as establishing needs, gaps to be addressed. The stakeholders also developed vision maps of how they would like the value chains to be like in 5-10 years. During the exercise they also identified other important partners in the value chains that should be engaged by the project team to get involved in some specific areas.

Potential value chains, value chain upgrading strategies and market characteristics

The project team conducted baseline surveys and held meetings and especially in the initial stages of the project for purposes of identifying the potential value chains for the different project sites. The team developed 8-point criteria for the selection of value chains to be implemented in the different districts, among which was the ability of a given value chain to influence lives of women and youth. A value chains strategy report (Oduol J et al 2017), highlighted the challenges faced by producers in each value chain of interest, existing market linkages, production and economic potential of the selected value chains. It revealed that production of most of the enterprises had not been fully exploited and there was opportunity to increase returns to investment by improving uptake of improved production methods such as use of improved seeds of soya beans or clean planting seeds of Solwezi beans, improved feeds and feeding practices in dairy and improved hives and alternative sites for placing bee hives in the honey value chain. In the coffee value chain, use of productivity enhancing inputs was low as most farmers were less motivated to invest in coffee because of fluctuating prices.

Similarly, use of productivity enhancing inputs in the rest of the enterprises was low either because of unavailability of the inputs or limited knowledge of the right input mix and economically viable options to undertake. The report also identified strategies for developing the selected value chains: coffee and soya beans producers thought that they would benefit significantly from vertical coordination upgrading to strengthen the level of interaction among producers and the private sector actors and improve their access to interlinked inputs and services. For dairy, honey, Solwezi

beans and village chicken value chains, the focus was improving productivity through use of improved production processes or technologies. The study recommended establishment of horizontal coordination of all value chains through strong and well-functioning producer groups (IPs) for better access to business development services such as credit and capacity building. The study also recommended strengthening the capacity of producer groups in governance issues including by-law formulation to improve their legality and functioning and make them bankable.

Value chain development strategies and best fit scenarios to support sustainable commercialization

The project identified three potential models for commercializing smallholder agriculture and these models were tested for their cost effectiveness using planned comparisons approach. The three models are:(i) linkage with private sector actors, mainly buyers of village chicken from Solwezi and speciality coffee from Australia. This model was tested during the implementation of the coffee planned comparison where a direct linkage of coffee farmers in Uganda with the Monastery coffee in Australia was considered very fruitful and greatly improved incomes of women farmers (ii) Co-financing of critical inputs for commercialisation e.g. incentivising village chicken producers to sequence production and take up co-financing of incubators and vaccination for local chicken in Solwezi. Although the implementation of the village chicken PC and the aggregation using incubators was intended, the PC encountered some challenges including regular power outages which effected hatching of chicks from the incubators (iii) Boosting productivity to secure reliable high-end markets e.g. fostering uptake of improved feeds and feeding practices among smallholder dairy farmers in Kapchorwa and Manafwa districts using innovative scaling approaches. A key publication under development for this milestone is titled approaches for commercialising smallholder agriculture (Oduol J et al).

Models for private sector engagement in market and value chains development

Private sector actors were engaged in most stages of the project. In Solwezi, mining companies were invited to multi-stakeholder meetings and during implementation of the village chicken PC while in Uganda the project team held meetings with the different private sectors. The SWOT analysis conducted during the multi-stakeholder meetings held in the three sites in Uganda and Zambia provided valuable information for identification of the models. Three models for engaging private sector actors were defined and were also tested through planned comparisons for their effectiveness and scaling up. These models include: (i) Aggregator model with some subsidy to incentivize farmers to engage in commercial village chicken rearing in Solwezi (ii) Brokering private sector-producer partnerships in the provision of processing equipment to foster producers' access to market for specialty coffee and (iii) Private sector actor's engagement in co-financing research in development. The last model was used to test approaches for incentivizing farmers to take up selective picking of coffee cherries for improved quality and quantity of coffee sold by farmers.

Commercialising of village chicken in Solwezi, Zambia

The village chicken value chain in Solwezi, Zambia presents several opportunities for commercialisation, given the increasing demand for organically produced foods but smallholder farmers are reluctant to engage in village chicken rearing as a business. To examine which scaling approaches work best to incentivise smallholder farmers to commercialise village chicken production, the project team randomly assigned farmers to two potential approaches: linking of producers with buyers and linkage with buyers coupled with additional information. It was hypothesised that while linking producers to a reliable market is necessary for commercialisation, this linkage must be coupled with provision of targeted information to induce significant change in commercialisation attitude among smallholder farmers. Longitudinal data obtained from a randomised control trial conducted between 2017 and 2019 on village chicken farmers was used to test the effectiveness of the two approaches and estimated changes in commercialisation behaviour using commercialisation index, consisting of scale, investment, management and marketing practices dimensions.

It was found that linking producers with buyers alone is necessary but not sufficient to induce significant investment in village chicken. Instead, provision of information coupled with linkage with reliable markets effectively motivates farmers to engage in farming as a business. However, gains from commercialisation could also be maximised if adequate infrastructure to alleviate structural barriers related to scale of operation, management practices and improved marketing practices is put in place. Incubation services put in place by the project however failed to take off because of

frequent power outages, thereby negating the benefits associated with economies of scale through aggregation and sequenced production.

Commercialisation intention for the village chicken value chain in Zambia

The baseline study on the village chicken value chain in Solwezi revealed that small-scale farmers do not consider village chicken rearing as a business but just take it as a way of life. Majority of them continue to undertake the activity at subsistence level despite the commercialization potential presented by this value chain given the high demand for village chicken in urban areas and mining companies. Past research considered socio-economic factors as drivers of village chicken commercialization and ignored the social psychological factors such as perceptions, intentions and belief. The project applied the theory of planned behaviour to ascertain the commercialisation intention of the village chicken smallholder farmers in Solwezi. We conceptualized that social psychological constructs influence smallholder farmers' intention to commercialize village chicken. The model constructs used included: attitude toward commercialization, subjective norms, perceived behavioural control, commercialisation practices intention and commercialisation scaling up intention.

Interventions used during the project to address barriers to village chicken commercialisation included: training on production and marketing of village chickens, market linkages bringing together producers and traders through the introduction of village chicken collection points in close proximity to the farmers, introduction of the weighing scale to standardize pricing practices, introduction of artificial incubation to encourage batch (staggered) production and introduction of a vaccination programme to mitigate high mortality rate of chicken due to rampant incidences of the Newcastle disease.

Results revealed that amongst standard socio-demographic variables, commercialisation practices intent was related most strongly to the gender of the participant with females significantly more likely to indicate a high level of commercialisation intent. Generally, the Theory of Planned Behaviour constructs showed a strong level of predictive capacity for commercialisation intention. Most importantly, perceived constraints on commercialisation and attitudes to commercialisation are critical factors associated with generating a strong commercialisation intention. Its therefore suggested that interventions should focus on alleviating perceived and real constraints to village chicken commercialisation and seek to promote greater awareness and appreciation of commercialisation models to improve adoption of commercial production models and engagement with markets.

Scalable approaches for promoting value chain innovation platforms

The project focused on the development, implementation and documentation of the planned comparisons (PCs) for the three priority value chains namely coffee, dairy and village chicken. The project adopted an impact evaluation methodology with a baseline and end-line surveys as well as treatments administered in the selected villages or camp clusters. A control group was also maintained to assist measure the counterfactual. The three PCs are briefly described below:

Dairy Planned Comparison

Dairy farmers in Manafwa and Kapchorwa were exposed to a 3-tier extension. This engagement resulted in the delivery of an innovative extension approach in Uganda where—in addition to basic training and scaling up of fodder shrub seedling production—farmers with similar demographic characteristics such as age, gender and own a cross-bred lactating cow were randomly selected as 'citizen scientists' in the community. Individuals were paired to ensure that both feeding and non-feeding farmers were included for comparison. A total of 28 farmers were randomly selected: 14 as feeding citizen scientists and another 14 and non-feeding. Pairs of feeding citizen scientists from each village were supported to ensure that they had access to sufficient quantities of calliandra for their cow together with proper feeding using normal feeds. Non-feeding citizen scientists did not make any changes to their feeding practices. Both groups were supported to keep records on feeding and milk yields.

Power of citizen science in enabling uptake of improved dairy feeding practices

Smallholder dairy production can be a means to agriculture-led economic development given its direct contribution to household nutrition and incomes. This, however, is not happening because of

poor livestock feeding practices used by dairy farmers. Such practices have persisted largely due to ineffective agricultural extension strategies that rely heavily on conventional approaches. Despite these methods harbouring inherent limitations, seldom have change agencies stopped to question their effectiveness. The VIP4FS project explored prospects of tapping into the latent strengths of citizen science to bridge the gap between research and extension, which has chronically curtailed uptake of improved dairy feeding practices by farmers in Mt. Elgon Region of Uganda. This action-research explored innovative ways of interesting smallholder dairy farmers in taking up improved fodder shrubs, in this particular case *Calliandra calothyrsus*.

One of the options involved volunteer citizen scientists selected from within the local community by lottery, experimenting on use of Calliandra fodder as a supplementary feed to increase milk yield. Working in symmetrical pairs, each of the citizen scientists in the 14 study villages recorded their daily milk yields over a 42-day period and shared their experiences with the rest of the community fortnightly.

Complementing conventional extension approaches (i.e. nurseries and one-day training) with citizen science instilled farmer confidence in using Calliandra. Being new in the farmers' context, the shrub risked not being readily embraced, for fear of having undesirable effects on the cows or the milk consumers. Citizen science allowed farmers' unrestrained scrutiny of the process as it happened, coupled with testimonies by their peers – the citizen scientists boosted farmers' confidence in the feed, which motivated its adoption.

Plate 1. A female citizen scientist presents her milk yields to farmers during a sharing session in in Manafwa district (left) and a project team member explains trends in milk yields to farmers as a result of feeding cows with calliandra

Results of the end-line survey indicate that milk yields among the calliandra-fed cows nearly doubled (increased from 5 to 9.22 litres/cow/day) but increased by less than one litre in the status quo feeding group. Mean and median gains were 3.24 (p=0.008) and 3.0 (p=0.033) litres, respectively (n=28). From the cluster randomized control trial of Calliandra uptake, preliminary results indicate that uptake of calliandra increased from 25% to 61% in the intervention clusters, against 26% to 42% in the control clusters, a relative difference of 20% (p<0.001; n=879).

The study revealed significant difference in uptake between the two districts with Kapchorwa district having a higher uptake in the intervention cluster compared to the control cluster (**Figure 10**). In both Kapchorwa and Manafwa districts, control group also had some presence of fodder grown on farm which would be due to information sharing between farmers in the different clusters, or due to presence of other projects that had promoted fodder before the project was started.

Unlike most conventional technology demonstration efforts, the rigor with which selection of participating citizen scientists was done enabled involvement of farmers that were "typical" of the local communities, as opposed to "progressive" farmers that are often not approachable by ordinary folk. The citizen scientists also remained within the farmers' community which enabled continued peer-to-peer learning, that is not usually possible in the conventional short training sessions used by most change agencies. Citizen science can therefore be used to bridge the gap between research and extension.

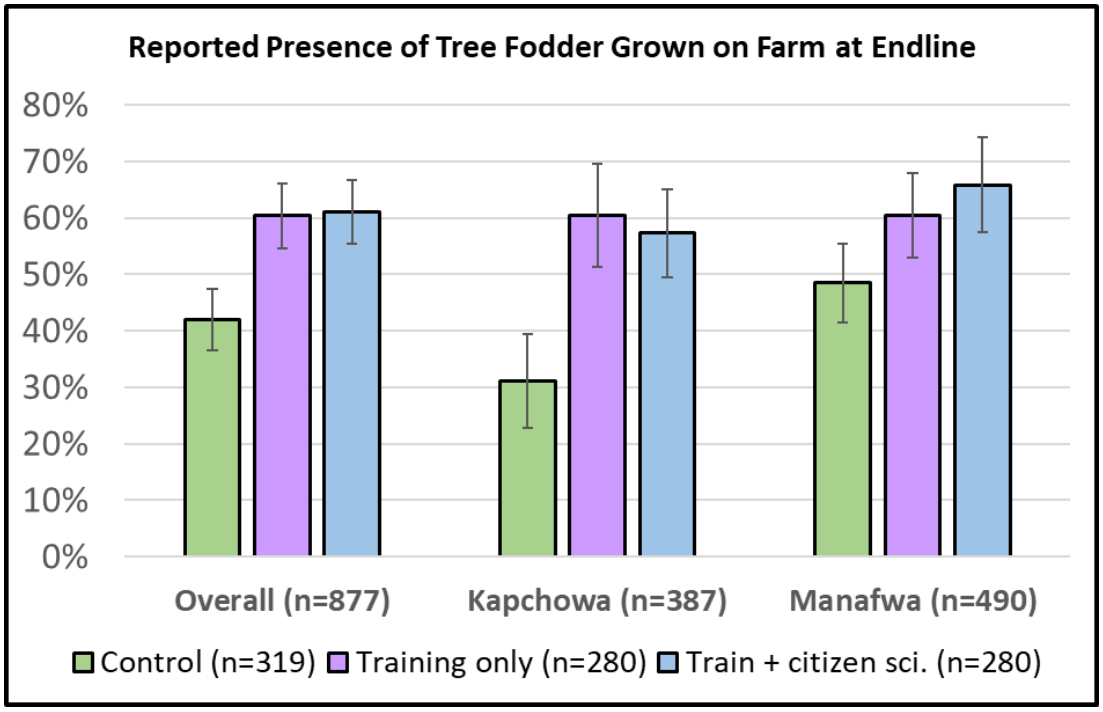

Figure 10: Uptake of calliandra by farmers at the endline

To complement the interventions on training and citizen science approaches, the project also engaged 15 tree nursery operators in the propagation of 350,000 calliandra seedlings in various sub-counties in Manafwa and Kapchorwa districts (**Plate 2**). Several distribution centres were also established in areas with no nursery operators to ensure that calliandra seedlings are readily available, especially around the intervention areas. Over 100,000 fodder seedlings in both Manafwa and Kapchorwa districts had already been sold generating income for the nursery operators.

Plate 2: Calliandra nurseries run by local nursery operators in in Manafwa and Kapchorwa districts

Coffee Value Chain

About 2000 farmers were trained on the importance of picking quality coffee cherries in Kapchorwa in conjunction with KAWACOM, a major coffee buyer in Kapchorwa district. During implementation, the University of Adelaide in collaboration with Monstery Coffee Company from Australia, engaged farmers in the process of purchasing quality coffee (**Plate 3**) from Mt Elgon Women in Coffee Innovation Platform plus other neighbouring innovation platforms. The coffee was graded and

exported to Australia for prime price and bonuses provided to farmers and coffee pickers according to quantities sold. The groups have so far exported more than 1.1 tonnes of coffee and have continued to buy more to sustain the business. Mt Elgon Women in Speciality Coffee Innovation Platform has joined national and international coffee platforms and has participated in international trade shows including one held in China in 2019.

Plate 3: High quality coffee (speciality grade) being dried in trays by Mt Elgon Women in speciality coffee Innovation Platform, Kapchorwa district, Uganda

Economic experiments

The following findings were observed from the economic experiments:

- There was a generally low trust levels among value chain actors (growers and traders) as the amount sent in trust game was 35% of the total endowment (which is lower than 50% of what is usually realized in similar contexts).
- The IPs were not formed with business orientation in mind but rather they were formed to allow members from different groups to learn and share knowledge.
- Growers trusted traders more, they also revealed altruistic behaviour towards them, due to repeated interaction.
- Altruism was the main driver of the amount sent in the trust game and risk does not matter.

Creation of demand – more market linkages

- Through Monastery coffee and Intersection Traders, coffee samples were supplied to 12 cafes, 6 roasters and 3 other well-respected traders within Australia to generate interest and so that they can put orders for higher quantities, hence creating a wider market.
- Other buying companies in Mt. Elgon region (Kawacom, Great Lakes and Green Hill company registered an increase in quality of cherries supplied in 2019 as opposed to the previous years.
- This ready market of Ugandan Coffee is expected to motivate producers to build on the volumes of high-quality cherries for increased income.

Coffee planned comparison implemented

A randomized experiment was used to test the effectiveness of two novel extension approaches in encouraging technology adoption. In the first approach, an extension worker was supported by a peer farmer and, in the second, by a high-status market actor was used in an extension meeting organized to encourage an increase in product quality and high-value market participation. Based on persuasiveness attribute of the communicator, it was hypothesized that the former approach was more effective in encouraging quality-improving practices, whereas high-status marketer would be more effective in encouraging high-value market participation compared to the standard

extension approach. The results showed that information does constrain adoption of quality- and market-improving practices by smallholder farmers. Additionally, coffee growers who receive information provided by only a local extension worker and a peer farmer adopt quality-improving practices, whereas growers exposed to the market actor adopt both quality- and market-improving practices. The results also show that adoption of both quality- and market-improving practices leads to higher coffee revenues for smallholder farmers implying that quality improvements alone do not yield higher agricultural revenues in the conventional channels but in high-value markets. The results of this work will be reported in detail in a PhD student's thesis.

Honey Value Chain

The project team worked on equipping beekeepers on better handling of bees and honey, as well as encouraging farmers to set up bee houses on various honey innovation platforms. A bee house is a unique invention by farmers who have several beehives in a confined environment. This ensures better management. Each bee house can host up to 185 beehives. The invention was necessitated due to strict regulations by Uganda Wildlife Authority to access of Mt Elgon National Park by surrounding communities. Beekeeping has potential to improve the incomes of farmers in the Honey IP. The Tegeres IP has established an additional bee house (**Plate 4**) to accommodate more farmers in the IP who have shown interest as well as to increase the amount of honey produced and sold.

Plate 4: A bee house established by Tegeres IP members in Kapchorwa district

Women empowerment in village chicken value chain

In most of Sub-Saharan Africa poultry rearing is mainly a responsibility of women within households. They are mostly responsible for routine management such as feeding, watering and vaccination, often with the assistance of children. The VIP4FS project trained farmers in village chicken breeding, management, vaccination and marketing in an effort to change farmer beliefs to take chicken as a business and as an alternative income generating activity, especially for women. The project hypothesized that implementation of various cost-effective interventions that aim to motivate farmers to increase investment in local chicken production would likely improve levels of women participation and benefit in the value chain. It was assumed that women have more stake in village chicken production and sale.

Using participation decision index as a proxy for women empowerment, we estimated the effects of the project on the overall change in decision making in village chicken value chain in Solwezi, Zambia. Three decision making aspects were tested: (i) decisions regarding the general management of the chicken including feeding and purchase of feeds, veterinary inputs and the breeding stock (ii) deciding when, where and who to sell the produced local chicken and (iii) decisions regarding how to use revenue from sale of local chicken.

Results indicate that there was no significant change in decision making power before and after implementation of the 3 treatment arms: treatment 1(chicken collection point only), 2 (chicken collection, training and incubation treatment) and control group from beginning and end of the project activities. This indicates that the project intention to target at least 50% women was not adequate in ensuring women participation and to benefit. The project also learnt that having

women as participants on project activities alone or selection of value chains assumed to target women does not necessarily lead to change in women participation in decision making in value chains. It was noted that for better women participation and change in decision making, projects should go further in ensuring information and interventions are tailored and relevant to women even in 'women' focused value chains such as village chicken. Projects also need to identify gaps and needs of women as well as target women as program participants and ensuring quotas for women's participation are met during community meetings or training programs and in implementation of project activities.

Strengthening the capacity of key stakeholder groups

The project focussed on improving the capacities of scientists, students and other stakeholders engaged within the project in two countries. In order to achieve improved capacities within the project, all planned activities were consultative and collaborative involving all partners during planning and implementation. This collaboration allowed all round learning from lead organizations as well as partners in the different countries. There was also deliberate effort to increase capacity of stakeholders in data collection processes and tools such as ODK and CSPRO and implementation of behavioural economics research in the three value chains of interest: coffee, dairy and village chicken planned comparisons. The planned comparison methodology, a rather new concept, was another critical learning opportunity for all the project team.

The project engaged 12 students (4 PhD and 8 MSc) as part of capacity development. One MSc student from Bangor University who undertook his field research on innovation platforms in Solwezi, has since graduated. The three MSc students from Makerere University are in the final stages of their studies and are expected to defend and graduate in 2020. A PhD student from Wageningen University, collected field data from Kapchorwa focusing on entrepreneurship skills among IPs while a PhD student from Gottingen, has completed implementing the coffee PC. She collected the end line data in Kapchorwa in collaboration with Kawacom- a private coffee company. She is currently finalizing her manuscripts to be submitted to international journals. Another PhD student in Zambia registered at the Copperbelt University completed his data collection during the end line survey of village chicken PC and is now writing up his thesis and papers for publication. All the students are being supervised by the senior members of the project team along with their university supervisors. Specific details all students and their areas of research are presented in **Appendix 11.1**.

8 Impacts

8.1 Scientific impacts

Experiences from the project have triggered changes in approaches employed by the national scientists on and off the project:

The landcare masterclass sessions delivered in Solwezi and Manafwa are cases in point, where strong connections have evolved across scales, fusing together global partners in the landcare movement, with national institutions and IPs operating at the grassroots. The intersection between commodity value chains, IPs and landcare principles is novel in the Mt. Elgon context as most change agents have until now tackled these inextricably linked phenomena in isolation.

The collaboration on the project between academia, national scientists and regional research centres has yielded synergies through which novel approaches have been shared. The application of behavioural economics by University of Adelaide and national scientists unlocked possibilities of Ugandan coffee meeting global specialty coffee standards, as opposed to doing business as usual. Similarly, the use of methodological innovations championed by ICRAF like citizen science, practical games and image-based dairies provides a new path to research in the two countries, most of which has been characterised by conventional methodologies.

Experiences gained from the dairy PC in Uganda, provided a basis for the project team to develop another research proposal to scale out similar extension approaches in Kenya and Malawi. Targeting 120,000 small-scale dairy farmers, this initiative seeks to bolster small-scale dairy farmer income and resilience, meeting the current deficit in national milk supply, and enhancing nutrition outcomes. The proposal has been funded with a budget of USD 1.2M. The research aims to show how a shift from the conventional could simultaneously demonstrate the cost-effectiveness of new approaches for promoting complex agronomic and sustainable land management innovations at a larger scale.

8.2 Capacity impacts

Impacts of training

The project strengthened capacities of national and grassroot institutions, as well as various value chain actors in their IPs to undertake appropriate management practices at various stages of the value chains:

a) From the training on dairy animal nutrition, feed production and conservation, smallholder dairy farmers in Manafwa and Kapchorwa have been exposed to the realities behind their persistently low milk yields. Through citizen science, the practical demonstration of improved dairy feeding and its effect on milk yields has brought about a belief in farmers that they can improve upon their own enterprises, as they have seen their peers do. In fact, increased use of improved fodder shrubs is already evident from the results of the endline survey, where uptake of Calliandra increased from 25% to 61% in intervention clusters, against 26% to 42% in control clusters. Significant spin-offs are expected from over 2,000 community members that participated in the citizen science feedback sessions. This is expected to significantly boost milk production in the area and thus contribute to improved incomes and household nutrition.
b) Training in selective picking of good quality coffee cherries sought to offset challenges faced by farmers in satisfying the quality requirements of the specialty coffee markets. Experiences of Mt. Elgon women in specialty coffee have shown prospects of farmers working together towards making breakthroughs into high-end coffee markets. Relatedly, the capacity built on the coffee farmers has to a greater extent brought to farmers' attention, the importance of proper record keeping, which is a key prerequisite for enabling traceability of coffee for global market. This has facilitated IPs in Uganda to participate in regional and international coffee expos.
c) Coffee growers who sold coffee through the Intersection Traders buying program made approximately 70% more money than those that sold their coffee to the open market or to other buying programs. The increased income enabled IPs to acquire coffee processing equipment thereby boosting their production.

d) We expect coffee pickers participating in picker gangs within the Intersection Traders buying program to earn substantially more income across the coffee harvesting season.
e) In Solwezi, training of farmers in improved management of village chicken has transformed the enterprise from being done as a casual undertaking to a business. Similar shifts in opinion are expected towards the soybean and Solwezi beans, following training and demonstrations of appropriate management of these crops by the project and market linkages.
f) Project teams in both Uganda and Zambia continued to build the capacity of IPs through training on group dynamics, facilitation skills, visioning and planning, and resource mobilization. Most of the IPs in both countries are now able to operate following established guidelines. The project has also focused on building trust and encouraging voluntarism to strengthen IPs in both countries. As a result, some IPs have facilitated the creation of two other IPs in their neighbourhoods.
g) Through interactions created while working on the project, national partners have gained exposure and some level of capacity to study socio-psychological parameters like trust, altruism and risk, which often compound uptake of technically sound innovations by farmers. This opens potential for vast areas of future research.
h) Through the students supported, the project has contributed to career development and nurtured collaboration between academia, national scientists, private sector, civil society and farmers. This mix is vital to the quest for holistic solutions to farmers' problems and the teams are now engaged in developing other joint projects.

The project strengthened infrastructural endowment of IPs in many ways including:

a) Six egg incubators were procured by ZARI for village chicken IPs in Solwezi and equipped with solar power back up to address the challenges of electric power outages. These will remain IP assets and are expected to boost village chicken production.
b) Through the Copperbelt University in Zambia, 2 smokers were purchased, for St. Francis and Mutanda IPs and were used for value addition training.
c) Two coffee washing stations were established in Kapchorwa, (Chema and Mt. Elgon Women in Specialty Coffee) and several drying trays with support of buyers. These will use used increase the volume of speciality coffee produced by IPs in Kapchorwa district.
d) Australian Landcare International donated 20 bicycles to Solwezi farmer association for farmer mobilization as result of a link created through a landcare master class conducted in Solwezi.
e) 3 bee houses were established by honey IPs through local resource mobilization and these are expected to boost honey production and income among IP members.
f) 15 fodder shrub nurseries were established in Tegeres (3) and Kapchesombe (4) sub-counties in Kapchorwa district, as well as Namabya (5) and Mukoto (3) sub-counties in Manafwa and Namisindwa districts to provide affordable *Calliandra* seedlings. These expected to play a key role in scaling up the project impacts

8.3 Community impacts

8.3.1 Economic impacts

a) In Kapchorwa, through linkages with Monastery Coffee from Australia, about 3 tons of specialty coffee were shipped to Australia. Coffee IPs are expected to produce and export more specialty coffee at substantially higher prices with expectations that the level of production will increase substantially over the coming years to over 14 tons in two years. Samples of the Uganda coffee have been supplied to 12 cafes, 6 roasters and 3 other well-respected traders in Australia to generate wider interest and thus be able to commission larger quantities.
b) The use of bee houses in Kapchorwa has gained popularity, with each hosting up to 135 beehives and producing about 20 litres of honey per hive per harvesting season. Each litre of honey is sold at UGX 4,000 (USD 1.1). With anticipated production of about 2,000 litres of honey per bee house, IPs expect to earn about UGX 8 million (USD 2,160). The market for honey is readily available.
c) In Solwezi, the village chicken farmers from St. Francis sold chicken worth ZMW 28, 070 (USD 2,339) while their counterparts from Mutanda generated ZMW 15, 303 (USD 1,275) from a similar endeavour.

d) The project has made an indirect contribution to coffee farmers' monetary wellbeing by making deliberate effort to understand their expenditures and savings through application of expenditure diaries to encourage saving culture.
e) Some IPs have started a process of registering as community-based organizations to enable them to attract additional resources for investment and creating sustainability.

8.3.2 Social impacts

a) The formation of IPs has led to the enhancement of social capital in all the three project sites, through which, farmers have begun to attract attention of key players in the value chains including the private sector. IPs have provided fora for actors (especially farmers and traders) to realize each other's value and the importance of teamwork, shared learning and building networks. There is also increased realization of the strength of IPs as frameworks for resource mobilization and self-sustained progress.
b) In Kapchorwa, the project is transforming the previously held norms about coffee picking. The project has demonstrated how smallholder coffee farmers can be encouraged to cost-effectively engage in selective harvesting to increase both quality and quantity of coffee produced and sold. Coffee companies in Mt. Elgon region e.g. Kawacom, Great Lakes and Green Hill, report increases in quality of cherries supplied in 2019 compared to past recent years, which may be spin-off effects of the project's concerted effort towards quality assurance in the coffee enterprise.
c) In Solwezi, with increased trainings, sharing of information with farmers, vaccination services and access to markets, there is increased appreciation and interest in village chicken production, which has transformed a previously neglected enterprise to a promising one. As village chicken gains more commercial value, farmers are expected to invest in better housing than the traditional perched tree technique common in Solwezi.
d) Dairy farmers in Kapchorwa and Manafwa are now improving dairy production with adoption of improved feeding practices. As such, there is widespread growing of improved fodder shrubs especially Calliandra, where previously cows were mainly fed on banana pseudo-stems, especially during the dry season. With increased sharing of information in IPs, uptake of better animal husbandry practices is expected to increase.
e) Conflict management training has enabled two disgruntled IPs factions in Tegeres to make peace. This is a positive sign towards maturity of IPs.
f) From an equity point of view, the coffee picker survey assessed contractual arrangements between growers and pickers, to generate an understanding of time allocations and payments to coffee pickers, and how increases in labour time allocated to coffee picking impact on other activities. By questioning payments made by growers to labourers, the project is bringing to the forefront issues of equity in the coffee enterprise, to which attention has previously not been paid in the public realm.
g) The use of simplified tools like tally and image-based coffee farmer dairies enabled completion by all people, including those with low literacy and numeracy levels.

8.3.3 Environmental impacts

While the different value chains do not directly influence the environment, there are key aspects in each of them that would address the environment in the medium and long run.

a) Increased adoption of improved village chicken management will result in increased use of chicken droppings as manure for boosting the productivity of Solwezi beans, soybeans and other key crops. The integrated nature of the different options offers promise for improving productivity and sustainability of the different value chains.
b) The concept of bee houses has evolved from an innovative idea seeking to reduce challenges experienced while keeping bees in the nearby Mt. Elgon national park. Rearing bees in bee houses minimizes human traffic into the park and the conflicts that had been associated with it. Experiences in Kapchorwa, have shown that location of bee houses on farms encourages farmers to plant trees and shrubs that attract bees and provide nectar. Such planting will increase on-farm tree cover and biodiversity as well as contribute to pollination services.
c) The project has fronted the use of shrubs starting with *Calliandra* for fodder, to increase productivity of the dairy enterprise. Besides, being a fodder shrub, *Calliandra* improves soil fertility and its integration on farms contributes to soil and water conservation on the steep landscape. With increased adoption and better management of dairy cows, some farmers in Kapchorwa are using manure generated by cows for producing biogas which is a clean form of

energy compared to firewood. Additionally, calliandra and other fodder shrubs are used to re-enforce soil and water conservation structures thus increasing farm productivity.

d) Adoption of landcare potentially has huge environmental impacts for soil and water conservation in the steep Mt. Elgon landscape with a dense population and highly fragmented landholdings. I pacts of this have been reported in Kapchorwa where this approach was started earlier.
e) The coffee buying program now rum by Intersection Traders is implementing a landcare and agronomy score providing greater payments to growers who have implemented actions which improve environmental sustainability and biodiversity. This is expected to contribute to sustainable coffee production in the Mt. Elgon region.

8.4 Communication and dissemination activities

Several communication products regarding the project work have been produced and disseminated to different stakeholders using blogs and articles. Links to communication products are provided in **Appendix 11.2**. Some articles have also been published in institutional magazines of partners and national print media. A write-shop was held with all the project partners and students in 2019 and manuscripts, policy briefs, brochures and other communication products were drafted and are now being finalized (**Section 10.2**). During the World Congress on Agroforestry (WCA) held in Montpellier, France (20-22 May 2019), four project team members participated and disseminated project findings. These included: Fergus Sinclair (Project Advisor), Clement Okia (Project Manager), Prossy Isubikalu and Gillian Kabwe (Project Country Coordinators for Uganda and Zambia, respectively). During this event two project presentations and two posters were presented. The project team in both Uganda and Zambia have continued to disseminate the project findings through various national and international events.

9 Conclusions and recommendations

The project sought to identify what makes value-chain IPs successful in terms of institutional, technological, market and policy factors, that determine IP performance and how the establishment of IPs can be most cost-effectively scaled up across a range of contexts. Planned comparisons (PCs) were used to test cost effectiveness of different approaches for developing the village chicken, dairy and coffee value chains. In the dairy value chain planned comparison, an innovative extension approach (citizen scientists) was tested and found to be effective. Based on the findings and lessons from this project, the following conclusions and recommendation can be made.

9.1 Conclusions

Use of Innovation Platforms (IPs) can be an effective approach for organizing smaller farmer groups into larger coalitions that bring together all the key value chain actors to work collectively to unlock the potential of agricultural value chains including facilitating access to high end markets with increased financial benefits to smallholder farmers.

The use of Planned Comparisons (PCs) is a significant shift towards involving many farmers in implementing different options under varying contexts, in particular, the use of citizen scientists to share results and experiences through local dissemination sessions is critical in facilitating information dissemination and adoption of improved practices.

The collaborative nature of the project involving international research and training partners along with national and local partners enabled national partners in both in both Uganda and Zambia to build their capacity in use of new approaches such as Innovation platforms, planned comparisons, citizen science, behavioural economics, value chain analysis and landcare principles. This facilitates mainstreaming of such approaches into national programs and project thus achieving scaling and sustainability of interventions.

The village chicken value chain in Solwezi, Zambia and the coffee and dairy value chains in Mt. Elgon region, Uganda present several opportunities for commercialisation given their economic, social and technological feasibility.

Linking village chicken producers with buyers/markets is necessary but not sufficient to induce significant investment in village chicken value chain. Instead, provision of information coupled with linkage to reliable markets effectively motivates farmers to engage in village chicken rearing as a business.

Complementing conventional extension approaches with citizen science can improve farmer confidence in adopting fodder shrubs as supplementary dairy feed.

Having women as participants on project activities through established quotas or selection of value chains assumed to target women does not necessarily lead to change in women participation in decision making in value chains.

Experiences of Mt. Elgon women in specialty coffee IP demonstrate prospects of farmers working together towards making breakthroughs into high-end markets. Relatedly, targeted capacity built of coffee farmers can awaken their attention on the importance of proper record keeping and improved quality which are key prerequisites for accessing speciality markets as these facilitate traceability.

Commercialization of smallholder agriculture benefits greatly from clear strategies for engaging with the key private sector actors to facilitate access to markets. Indeed, the private sector can be a key partner for co-financing of critical inputs for value addition, boosting productivity and co-financing the research in development process. The private sector's clear idea of market requirements (e.g. for specialty coffee) is critical in the whole process.

9.2 Recommendations

The project adopted an impact evaluation methodology with a baseline and end-line surveys as well as different treatments administered in the selected sites. Such approaches require more time at the start of the project to build the capacity of the project team, develop the treatment protocols and other tools for tracking impact. Its therefore recommended that, adequate time and resources are allocated to these activities to avoid delaying or constraining other project activities.

The project identified potential models for commercializing smallholder agriculture as well as models for engaging private sector actors in value chain development. Though there was an attempt to test these models for their cost effectiveness using planned comparisons approach, these models require further refining in similar or different contexts with private sector involvement right from the design up to implementation stage. Such an approach would make the models more robust and adaptable for wide scale application.

For better women participation and change in decision making, projects should go further in ensuring that information and interventions are tailored and relevant to women even in 'women' focused value chains such as village chicken. Projects need to identify gaps and needs of women and make deliberate efforts to address them. Furthermore, adequate time should be allowed between implementation of interventions and impact monitoring for effective identification of effects on complex and potentially slow-moving targets like women's decision-making.

Through interactions created while working on the project, national partners gained exposure and some level of capacity in new reach and development approaches. This cross-institutional collaboration and learning was highly beneficial and recommended in future ACIAR projects.

The use of MSc and PhD students was highly beneficial to project and to the students themselves as their skills were developed in new research and development fields and well as in scientific writing. However, there is need for careful selection of students to be engaged in future projects. For both MSc and PhD students, it may be more appropriate to engage those who have completed their University course work so that they can have adequate time to undertake field research early in the project life and complete their studies on time.

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10.2 List of publications produced by project

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4. Barzola Iza, C.L. (2019). The Influence of multi-stakeholder platforms on agricultural innovation and rural development: Examples from Uganda. PhD Dissertation, Wageningen University and Research, to be defended on October 25th, 2019.
5. Barzola Iza, C.L. and Dentoni, D. The role of farmers' value network embeddedness on agricultural innovation in multi-stakeholder platforms. Paper submitted to NJAS Wageningen Journal of Life Sciences.
6. Barzola Iza, C.L. and Dentoni, D. The role of farmers' entrepreneurial orientation on agricultural innovation in multi-stakeholder platforms. Paper submitted to Journal of Agricultural Education and Extension.

7. Daniel Gregg and David Just: Consumption and income dynamics of the rural poor: Evidence for behavioural consumption theories using high-frequency household-level income-diary data in rural Uganda
8. Nicole Mead, Emily Garbinsky and Daniel Gregg: How (and When) Self-Perceptions Increase Saving
9. Cansin Arslan, Daniel Gregg and others. Drivers of participation in higher cost and lower value coffee markets: A case study of parchment market participation in eastern Uganda from an asymmetric information and credit constraints perspective
10. Daniel Gregg, Randy Stringer, Cansin Arslan, Prossy Isubikalu, Adam Marley, Eddy Collett: Output quality incentives under aggregation and monitoring failure in smallholder-dominated coffee supply chains: A case study of coffee production in eastern Uganda
11. Cansil Arslan 2019: The role of information on adoption of quality-improving practices: Evidence from smallholders in Uganda

Draft Papers and concepts under preparation (from write shop)

1. Oduol J, Chawala M, Kimaiyo J, Kasonde K, Kabwe G, Kegode H and Hughes K 2019. Approaches for commercialising smallholder agriculture
2. Chawala M, Mwiya B, Kabwe G & Oduol J 2019. Applying the Theory Of Planned Behaviour in Village Chicken Farmers' Commercialisation Intention – Evidence From North Western Zambia
3. Kimaiyo J, Oduol J, Kabwe G and Okia C 2019 Participation in Decision-Making: Contributions Of VIP4FS Project to Women Empowerment In Village Chicken Value Chain
4. Gregg D, Isubikalu P, Stringer R, Arslan C, Marley A, Collet E, Ekoot L and Tuhaise I 2019. Output Quality Incentives in Smallholder dominated Supply Chains
5. Ekoot L, Gregg D, Isubikalu P, Okia A, Tuhaise I & Stringer R 2019. Coffee Pickers Perception Towards Conditional Payment Contracts in Generating Cherry Quality Improvements
6. Tuhaise I, Isubikalu P, Sseguya H, Nasirumbi L, Sekatuba J, Gregg D, Stringer R, Ekoot L, Kimenya G, & Okia C 2019. Innovation Platform Networks Enhance Smallholder Producers' Participation In Coffee Marketing
7. Kegode H, Hughes K, Oduol J, Kimaiyo J, Sekatuba J, Isubikalu P & Okia C 2019 Enhancing Milk Production Through Scaling Up of Fodder Feeding Practices
8. Sekatuba J, Kimenya G, Kegode H, Kimaiyo J, Isubikalu P & Okia C 2019. Power of Citizen Science in Enabling Uptake of Improved Dairy Feeding Practices
9. Peralta et al 2019. Do coffee growers "trust" their trader? Experimental evidence from Uganda. University of Adelaide
10. How (and When) Self-Perceptions Increase Saving (Revise and Resubmit, Journal of Marketing)
11. Consumption and income dynamics of the rural poor: Evidence for behavioural consumption theories using high-frequency household-level income-diary data in rural Uganda
12. Bitter coffee: Output quality incentives under aggregation and monitoring failure, a case study of a model for scalable upgrading of coffee supply chains

Planned Working papers VIP4FS work

1. Household bargaining and gender empowerment in rural Uganda
2. Relationships with the powerful: The role of relationship coffee in perpetuating inequality in rural coffee producing communities
3. Reverse auctions for sustainable, efficient and ethical procurement in smallholder-dominated supply chains
4. Picking red but seeing green: quality-conditional harvesting contracts for ethical and high-quality coffee production (already stated but need more data)
5. Income and savings impact of an ethical smallholder-oriented coffee supply chain

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4. Kimaiyo J & Oduol J 2018 Providing evidence for impact: Dairy Planned Comparison in Uganda, World Agroforestry centre science week, Sep 2018
5. Muthuri C et al 2018 Developing value chain innovation platforms to improve food security in East and Southern Africa –VIP4FS presentation during Afr symposium Nairobi Kenya

Posters

1. Isubikalu et al 2019 **Using Value Chain Innovation Platform Approach to Improve Food** security in Mt. Elgon sub-region: the case of coffee, dairy and honey among smallholder farmers in Kapchorwa and Manafwa districts, presentation in the World Agroforestry Congress, Montpelier France
2. Kimaiyo J Harnessing the Potential of the Innovation Platforms through Landcare: A case of VIP4FS project, presentation in the Landcare conference, Uganda.

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2. Wealthy women and a healthy nation through high-quality coffee by Muthuri May and Kimaiyo Joan 2018
3. Refining honey production through investing in bee houses by Muthuri May 2018
4. Landcare - Adding value and inspiring change in the Mount Elgon region of Uganda by Jason Alexandra, Alexandra associates
5. Milk & honey—innovation platforms take hold in Uganda by ACIAR
6. The bigger the numbers the louder the voices: the story of innovation platforms in East Africa by Joan Kimaiyo 2017
7. Introducing Landcare approach to Solwezi District by Joan Kimaiyo and Evelyne Kiptot. Feb 2017
8. "planned comparison" options for the value chains innovation platforms by Joan Kimaiyo, Ruth Kinuthia and Evelyne Kiptot. May 2017
9. VIP4FS project holds multi-stakeholder workshops in Eastern Uganda by Joan Kimaiyo, Ruth Kinuthia and Evelyne Kiptot. Nov 2016
10. Value chains innovation platforms holds multi-stakeholder workshops in Solwezi Zambia by Joan Kimaiyo and Joseph Tanui, June 2016
11. VIP4FS projects holds its first steering committee by Ruth Kinuthia, Joan Kimaiyo and Evelyne Kiptot. June 2016

11 Appendixes

11.1 Students engaged in the VIP4FS project in Uganda and Zambia

Student Name	Degree/University	Research Area	Status
1. Moubarakatou Tassou,	MSc Nairobi University	Factors affecting participation in non-timber forest and agroforestry products with specific emphasis on the honey value chain in Uganda	Completed
2. Martina Mordini	MSc Wageningen University	"Farmers' characteristics and entrepreneurial competences for innovation in Ugandan multi-stakeholder platforms".	Completed
3. Twan van der Slikke	MSc Wageningen University	Understanding the relationships between farmers' value network embeddedness and their farm innovation	Completed
4. Pema Wangchuk	MSc student, University of Adelaide	Literature review on coffee value chain in Eastern Africa and Uganda	Completed
5. Carlos Barzola Iza	PHD Wageningen University	The Influence of multi-stakeholder platforms on agricultural innovation and rural development: Examples from Uganda.	Completed
6. Robert Ochago	PHD Wageningen University	The extent to which IPs are enhancing entrepreneurial experiential learning among coffee smallholder farmers	Writing up
7. Wisdom Nyondoh	MSc Bangor University	Assessing collective action as a strategy for enhancing participation of smallholder farmer associations in agricultural value chains	Completed
8. Cansin Arslan	PHD Gottingen University	The role of information in adoption of quality- and market-improving practices and returns in Uganda	Writing thesis
9. Moffat Chawala	PHD Copperbelt University	Innovative Collective Marketing Interventions and Sustainable Smallholder Farmer Profitability in Agriculture Food Value Chains through Innovation Platforms: A Case of Women and Youth Agripreneurs in North Western Province of Zambia	Writing thesis
10. Leonard Ekoot	MSc Makerere University	How incentives motivate IP members to produce coffee cherries that meet the required quality standards	Writing thesis
11. Innocent Tuhaise	MSc Makerere University	How the social capital built in IPs enhances participation of women in marketing opportunities	Writing thesis
12. Raymond Kasaato	MSc Makerere University	How participation in collective activities enhances intra-social bonding among IP group members	Writing thesis

11.2 Communication and dissemination products under VIP4FS project

- Refining honey production through investing in bee houses: http://blog.worldagroforestry.org/index.php/2018/10/09/refining-honey-production-through-investing-in-bee-houses/
- Wealthy women and a healthy nation through high quality coffee: http://blog.worldagroforestry.org/index.php/2018/10/15/wealthy-women-and-a-healthy-nation-through-high-quality-offee/
- Improving dairy production through agroforestry and innovation: http://blog.worldagroforestry.org/index.php/2019/07/18/improving-dairy-production-through-agroforestry-and-innovation/?fbclid=IwAR0EH7ayzr0a-28U6yO1UER6h0p1I39KV4hE1pGC16J_H2LiQtAaG1ZDW0g
- Bikes for Landcare Zambia: https://australian-landcare-international.pozible.com/project/bikes4landcare-zambia.
- Coffee Innovation Platform in Uganda exports coffee to Australia: https://www.youtube.com/watch?v=x8uf48Vx9_I&t=183s
- Article on Manafwa landcare training http://www.worldagroforestry.org/news/landcare-adding-value-and-inspiring-change-mount-elgon-region-uganda
  Building landcare in Uganda: https://www.crawfordfund.org/news/news-building-landcare-in-uganda-january-2019/
- Uganda Landcare Visit by ALI: https://alci.com.au/uganda/
- Uganda exports coffee to Australia: https://www.youtube.com/watch?v=x8uf48Vx9_I&t=183s
- Some of the training materials and reports: https://www.dropbox.com/sh/tn1zwl36vw34850/AAA_9GXDVd0OYwKL_zRbVprFa?dl=0
- Improving dairy production through uptake of agroforestry trees and innovation platforms: http://blog.worldagroforestry.org/index.php/2019/07/18/improving-dairy-production-through-agroforestry-and-innovation/
- Innovation platforms sweeten milk and honey value chains https://www.aciar.gov.au/publication/Partners-2020-Issue-1