Further Analysis of AgFiMS 2011 Findings

AGFIMS
AGRICULTURAL FINANCE
MARKETS SCOPING
TANZANIA

FSDT
FINANCIAL SECTOR DEEPENING TRUST

ABOUT FSDT

The Financial Sector Deepening Trust (FSDT) was established in 2004 to improve the capacity and sustainability of the financial sector to meet the needs of MSMEs and poor men and women. Our mission is to generate sustainable improvements in the livelihoods of poor households through reduced vulnerability to shocks, increased incomes and employment achieved through providing greater access to financial services for more men, women and enterprises.

Our vision is to achieve improved capacity and sustainability of the financial sector to meet the needs of MSMEs and poor men and women and to contribute to economic growth.

For more information on the FSDT, please see our website on www.fsdt.or.tz

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1 Executive Summary

In 2011 the Financial Sector Deepening Trust (FSDT) in collaboration with the Gatsby Charitable Foundation and the Rockefeller Foundation funded the **Agricultural Finance Market Scoping Survey (AgFiMS)**: the first-ever national survey on the nature of demand for and supply of agricultural finance in Tanzania. The demand side component of AgFiMS comprises a survey of 4,094 agricultural enterprises, including three categories: 3,734 producers, 104 processors and 256 service providers.

In order to focus on agribusinesses with the potential to be ***commercially viable***, the following thresholds were included in the sampling process:

- *Producers:* a turnover of USD 600 or more per annum from agricultural activities and/or all those using five acres or more for agricultural activities;
- *Processors and service providers:* a turnover of USD$ 1,500 or more per annum.

The headline findings of AgFiMs were publicised and disseminated in 2011/2012 to key stakeholders from the public, private and donor sectors within Tanzania, to raise awareness of the data. In order to further deepen the understanding of the AgFiMS findings with stakeholders in each sub-sector (private sector, public sector and development partners) and promote new investment and initiatives, FSDT has launched a Dissemination Strategy.

As a first step, Triodos Facet was engaged to conduct further analysis, with the aim to further explore and analyse market possibilities within the dataset. This research focused on two levels:

a) *Value Chains*: in-depth analysis into key value chains: maize, rice and beans for staple crops, tobacco, cotton, coffee, cashew and sunflower for cash crops, as well as the livestock sector;
b) *Regions*: analysis of opportunities for each of the eight agro-ecological zones, incl. Zanzibar.

The assignment was undertaken in two phases between September 2012 and February 2013 and involved an exploratory analysis, followed by in-depth explanatory analysis. The final results were presented to FSDT, Gatsby Charitable Foundation and other consultants engaged in the Dissemination Strategy in January 2012.

This report presents the main findings from our research. After a short description of the context of the survey and the background to the assignment in chapter 2, a more detailed explanation of the methodology that was used in the analysis is given in chapter 3. Chapter 4 presents the main findings from the exploratory analysis and chapter 5 does the same for the explanatory analysis. Finally, in chapter 6 we present the main conclusions and recommendations, as well as some suggestions for further research and workshops on the use of the data. The focus of the explanatory analysis was limited to the producers as the sample size of the other categories was too small.

1.1 Conclusions and Recommendations

The regression analysis which was carried out in the second phase of the assignment produced a wide range of interesting findings. The main focus areas we concentrated on were (i) turnover per acre (as a proxy for productivity); (ii) use of savings products; (iii) use of credit products; (iv) use of insurance; (v) use of irrigation and (vi) credit information gaps. Each of these “dependent variables” was linked to wide array of “independent variables” to determine their correlation. The results are described in detail in chapter 5 and summarised at the end of that chapter.

In the final chapter the main conclusions are presented together with specific recommendations for the different stakeholders involved (financial institutions, insurance companies, the public sector and the development community). Where possible these recommendations were narrowed down to focus on specific value chains and/or agro-ecological zones.

The **first key finding** states that the use of formal savings products is strongly correlated to turnover per acre. This leads us to recommend the promotion of savings products by financial institutions both as stand-alone products as well as in combination with other financial products such as credit, leasing or warehouse receipts

schemes. These savings products could be linked to financing schemes aimed at facilitating the introduction/upgrading of irrigation systems in specific value chains.

The **second key finding** states that producers with lower turnover, who tend to have higher turnover per acre, are underserved by formal financial institutions. This is turn implies that these producers – those with a turnover roughly in the range of USD 600-1200 – may be an interesting market segment in terms of productivity and growth potential. Thus, we recommend financial institutions to develop and promote credit and savings products specifically for this market segment.

The **third key finding** states that record keeping (in particular keeping records of business expenses), group membership, extension services and business registration are positively correlated with access to formal financial services, in a number of value chains and zones. Thus, we recommend that the public sector and the development community should focus on up-scaling these factors in the respective zones and value chains where they are strongly correlated with access to finance.

The **fourth key finding** states thatthe use of insurance is negatively correlated with turnover per acre, in most value chains & zones.Caution is warranted here, as this should not be interpreted as suggesting that insurance leads to lower productivity! Rather, we suggest that formal insurance, which is still only rarely used by agribusinesses in Tanzania, has hitherto been mainly used by larger businesses which typically have lower turnover/acre. Thus, we recommend that suitable insurance products should be developed for farmers, with a focus on weather insurance.

The **fifth key finding** is thatolder businesses and older farmers lack information to obtain creditor they think that they won't be eligible to obtain credit. Interestingly, we also found a positive relation between use of cell phones and formal saving, which is compatible with the previous finding as the use of mobile phones is more generalized among youth. Thus, we recommend financial institutions (and other stakeholders) to use appropriate media to inform specific age groups on how and where to obtain financial products, ranging from bank account to loans.

Further in-depth research into some of the key findings may lead to interesting results, verify (or falsify) our conclusions and suggest new interpretations and recommendations. Thus, perhaps the main result of our analysis is the identification of a large number of hypotheses, which call for further – quantitative and qualitative - research to determine their validity and draw implications for new policies and specific interventions from the different stakeholders.

1.2 Recommendations for the Future

1. **Additional rounds of data collection**
   In order to get a better understanding of causal relations between variables, we recommend to repeat the AgFiMS survey periodically. Adding the time dimension to the analysis will allow for better identification of trends.

2. **Collect more quantitative data on financial services**
   Inclusion of questions key financial indicators, such as amounts borrowed/saved, product terms and repayment rates in future surveys is recommended in order to get a better understanding not only of *whether* such products are used but also *how* they are used.

3. **Collect more quantitative data on other indicators**
   Likewise, inclusion of questions on other relevant producer information, such as sales prices that farmers received for their produce, yields per acre, costs of production, and types and quantities of inputs used is recommended to get a better picture of their business performance.

4. **Collect more quantitative data on external indicators from other sources**
   The AgFiMS could be complemented with external agronomic, economic and meteorological data, which could serve to verify some of the findings, e.g. on productivity and weather risks.

5. **Reconsider the size and composition of the sample**
   The company that designed and implemented the survey made a commendable effort to ensure that the sample that was representative of the main value chains and agro-ecological zones. Nevertheless, there are still a few aspects that could be improved. For instance, the sampling for the coffee sector resulted in an over-representation of farmers in the Lake zone and an under-representation of farmers in the Northern zone. Since the type of coffee that is produced in these two zones is quite different – mainly Robusta in the Lake zone, mainly Arabica in the Northern zone – this may lead to an unintended bias and hence less significant results for the coffee sector as a whole.

6. **Workshops on use of data**
   The AgFiMS dataset is very rich and there is still more potential for digging deeper. Therefore, it would be worthwhile to organize workshops - facilitated by an external organization - with different stakeholders on how to work with and interpret the AgFiMS data. Triodos Facet would be pleased to play a role in such a follow-up activity.

2 Background

Agriculture is the foundation of the Tanzanian economy. Among the world's countries, Tanzania's gross domestic product is the fifth most dependent on agriculture. Around 75% of the population's 22 million labour force works in the agricultural sector. However, agricultural GDP has only grown at an estimated 3.3% per year since 1985, while GDP in general showed growth rates around 6-7% per year. Despite its importance for the Tanzanian economy and livelihood of its population, there is striking lack of appropriate financial services for agricultural enterprises.

In 2011 the Financial Sector Deepening Trust (FSDT) in collaboration with Gatsby Charitable Foundation and the Rockefeller Foundation funded the Agricultural Finance Market Scoping (AgFiMS): the first-ever national survey on the nature of demand for and supply of agricultural finance in Tanzania. The premise of AgFiMS is that the lack of good quality information on the nature of demand for and supply of agricultural finance contributes to a lack of investment in the sector. Better information will help to increase the flow of finance to the agricultural sector.

AgFiMS has two components:

- The *supply side component* seeks to quantify how much finance there is in agriculture and understand the various channels through which it is deployed (including agribusinesses such as inputs providers).
- The *demand side component* comprises a survey of agricultural enterprises, across three broad categories (producers, processors and service providers) and from small farms managed on a commercially sustainable basis up to large processing or trading companies.

AgFiMS Tanzania Demand Side Survey 2011 – In a Nutshell

- AgFiMS Tanzania 2011 had, at its core, the objective of identifying potentially ***commercially viableagribusinesses*** in Tanzania.
- AgFiMS defines ***agribusinesses*** as:
  - *Agricultural producers who sell more than they consume* (and therefore not including subsistence farmers);
  - *Processors of agricultural produce* – i.e. individuals or businesses who buy or get agricultural products from farmers and change it to another form;
  - *Agricultural service providers* – i.e. individuals or businesses who provide a service mainly to agricultural producers or processors including, for example, input providers, information services, agricultural manufacturers, providers of agricultural equipment, professional service providers such as veterinarians, as well as traders such as wholesalers, retailers and middlemen.
- To focus on agribusinesses with the potential to be ***commercially viable***, the following thresholds were included in the sampling process:
  - *Producers:* a turnover of USD 600 or more per annum from agricultural activities and/or all those using five acres or more for agricultural activities;
  - *Processors and service providers:* a turnover of USD 1,500 or more per annum.
- Of the total estimated 2 million agribusinesses in Tanzania, 25% met the AgFiMS selection criteria, i.e. approximately 520,000 agribusinesses;
- A nationally representative sample was drawn from this base and resulted in ***4,094 respondents***;
- In 2001, data was collected from 4,094 agribusinesses through face-to-face interviews with business owners: ***3,734 producers, 104 processors and 256 service providers***.

Source: AgFiMS Tanzania 2011, Full Technical Demand Side Report, July 2012

Following the completion of the fieldwork in August 2011, the headline findings of AgFiMS were publicised at a high level to key stakeholders from the public, private and donor sectors within Tanzania, to raise awareness of the data.

As a next step, the Dissemination Strategy aims to drive change in the agricultural finance market by addressing three key challenges holding back the agricultural finance sector:

(i) *Market understanding*: Identify agri-businesses' unmet financial services and finance needs; engage financial providers to review new market opportunities, financial services and products that would meet those needs effectively, as well as to make recommendations about potential product/service distribution channels;

(ii) *Capacities to growth (e.g. borrowing capacity):* identify the capacities of agri-businesses that need to be developed or enhanced to enable them to engage with the financial sector in a sustainable manner. This includes identifying relevant service providers, value chain actors or technical assistance consultants, engage them in terms of these findings and help them develop models to build or enhance these capacities;

(ii) *Policy barriers*: Identify constraints preventing agri-businesses from effectively engaging with financial institutions – these could be in policy & regulation, infrastructure or market organisation; identify and engage with relevant stakeholders to make recommendations about ways to overcome these constraints.

The overall objective of the Dissemination Strategy is to deepen the understanding of the findings of AgFiMS with stakeholders in each sub-sector (private sector, public sector and development partners) and promote new investment and initiatives. This will be done in three steps:

- *Further Analysis*: to generate knowledge stakeholders need to make informed decisions;
- *Publicity*: to raise awareness among stakeholders on the survey and its possibilities;
- *Technical Assistance* to private and public sector players to help them benefit from the data.

Triodos Facet has been engaged by FSDT for the first component: Further Analysis, with the aim to further explore and analyse market possibilities within the dataset.

3 Methodology

As stipulated in the terms of reference, the research focused on two levels:

c) *Value Chains*: in-depth analysis into the key value chains (maize, rice and beans for staple crops, tobacco, cotton, coffee, cashew and sunflower for cash crops, as well as dairy sub-sector);
d) *Regions*: analysis of opportunities for each of the seven agro-ecological zones;

The analysis will be undertaken in two phases: exploratory analysis, followed by in-depth explanatory analysis.

3.1 Phase 1: Exploratory Analysis

Given the importance of providing actionable analyses that are useful for the key stakeholders, in phase 1 we conduct an exploratory analysis of the dataset. Acknowledging the wealth of data that has been collected through the AgFiMS survey, we first map and analyse the data according to each of the individual survey questions, on the levels of both value chain and agro-ecological zone.

Figure 1: Map of Agro-Ecological Zones of Tanzania

Furthermore, we triangulate the data on the level of key value chains and agro-ecological zones in order to be able to analyse and formulate recommendations on matters that are specific not only to a certain value chain and/or a certain zone, but to the level of a certain value chain within a certain zone, e.g. the use of savings products amongst maize agribusiness in the Eastern region vs. the Western region. The conceptual framework for this first part of the analysis is outlined in the table below:

Survey section	Question	Value Chain 1			Value Chain 2 etc...		
		Zone A	Zone B	Zone C	Zone A	Zone B	Zone C
A. Nature of the Business	1						
	2						
	Etc..						
B. Size And Sophistication of the Business etc...	1						

3.2 Phase 2: Explanatory Analysis

This phase serves to conduct in-depth statistical analyses on key challenges and opportunities identified in phase 1, and formulate concrete policy recommendations. In this phase, we employ the statistical tool of regression analysis in order to gain a better understanding of the correlations between the different variables in the dataset.

The key advantage of applying the method of regression analysis is that it allows for the investigation of the correlation between multiple variables. For example, there can be a positive correlation between the consumption of lighters & the rate of lung cancer in a country. One might wrongly infer from this that lighters lead to lung cancer! In a regression analysis one may look how a number of variables (independent variables) correlate with one other variable (the dependent variable). In the case of lung cancer, one can 'control' for other factors that may correlate with lung cancer rates, e.g. actual cigarette consumption (which happens to be, in turn, strongly correlated with consumption of lighters). When doing so, one will be able to identify that actual cigarette consumption has a much stronger correlation with lung cancer rates than does the consumption of lighters. Subsequently, one can control for other factors such as age, gender, diet, exercise etc[1].

As under Phase 1, these analyses are conducted on the levels of both value chains and agro-ecological zones. Please note here that we did not apply the regression on the triangulations of these two dimensions, but rather on the two dimensions separately (i.e. regressions *per* value chain & regression *per* zone, but not regressions *per* value chain *per* zone). The reason for this difference is (i) that the sample size per triangulated value chain-zone combination is often too small to 'reveal' statistically significant correlations and (ii) that value chains & zones are strongly clustered, e.g. majority of cashew farmers in southern zone.

It must further be noted that we apply two types of regression analysis, depending on the type of dependent variable. In cases where the dependent variable has only two values ('yes' or 'no', for example in the case of looking at formal savings products – someone either has or does not have a formal saving product) we apply so-called logit regression. In cases where the dependent variable has a continuous range of value (e.g. in the case of turnover/acre, which can take any value) we use the so-called ordinary least squares (OLS) regression[2].

Subsequently, we applied the regression analyses only to the sub-sample of *producers,* for a number of reasons. Firstly, this allowed us to apply the regression analyses on the level of value chain – which is not classified for processors and services providers. Secondly, it provides a more focused understanding of the dynamics at the level of the main group of respondents, the producers, which as was shown in phase 1 differ substantially in terms of a number of important characteristics such as turnover.

The dependent variables that we looked at in the regression analyses are:

1) <u>Turnover/acre</u>

This variable reflects the turnover in multiples of 1000TZSh (question Q1a) per acre of land in use (question E4).[3] This variable is an indicator for productivity, although caution is warranted here – since the turnover figures are not corrected for fluctuations in prices of agricultural products (on which we did not have data). This is continuous variable, and the average is 480K TZSh.

Variable	# Obs.	Mean	Std. Dev.	Min	Max
Turnover/acre (*1000TZSh)	3717	479.7665	1415.571	.65	37500

2) <u>Use of savings products through formal channels</u>

This variable reflects whether someone has saved with a formal institution, i.e. a bank, MFI and/or SACCO (question L2)[4]. This variable has value=1 if someone has saved with a formal institution, and value=0 if this is not the case. On average, 23.9% of producers have saved through a formal channel.

[1] For a more elaborate overview of the method of regression analysis, see: http://en.wikipedia.org/wiki/Regression_analysis

[2] For a more elaborate overview of logit and OLS regression, see: http://en.wikipedia.org/wiki/Ordinary_least_squares&http://en.wikipedia.org/wiki/Logistic_regression

[3] Please note that the turnover data pertain to the year 2010 whereas the acreage data pertain to the year 2011.

[4] Based on comments during the final presentation we have tested whether the results pertaining to formal financial service usage are strongly dependent on whether VICOBA's are also categorised as formal financial institutions, but this was not the case. More details about the tests are available upon request.

Variable	# Obs	Mean	Std. Dev.	Min (no)	Max (yes)
Formal saving	3734	.2394215	.4267876	0	1

3) Use of credit products through formal channels

This variable reflects whether someone has borrowed with a formal institution, i.e. a bank, MFI and/or SACCO This variable has value=1 if someone has borrowed with a formal institution, and value=0 if this is not the case. On average, 14.0% of producers have borrowed through a formal channel.

Variable	# Obs	Mean	Std. Dev.	Min (no)	Max (yes)
Formal borrowing	3734	.1403321	.3473778	0	1

Of the people that attempted to borrow through formal channels (bank, MFI, SACCO) 65% succeeded in actually obtaining a credit through one or more of these channels.

FORMAL BORROWING	Did *not* succeed	Did succeed	Total
Did *not* attempt	3,355	18	3,373
	99.5%	0.5%	100%
Did attempt	253	468	721
	35%	65%	100%
Total	3,608	486	4,094
	88%	12%	100%

4) Use of irrigation scheme

This variable reflects whether someone has an irrigation scheme. This variable has value=0 if someone does not and value=1 if someone does have an irrigation scheme. On average 21.6% of people have an irrigation scheme.

Variable	Obs	Mean	Std. Dev.	Min (no)	Max (yes)
Irrigation scheme	3374	.2163604	.4118238	0	1

5) Lack of access to information

This variable reflects whether people were restrained from borrowing as a result of:

a. not knowing where to borrow and/or
b. having the perception that no institution will lend to them.

Among the group of people that did not borrow money, 41.8% did not do so because of either or both of these reasons. This variable has value=1 if either or both of these reasons restrained someone from borrowing and value=0 if this was not the case.

Variable	Obs	Mean	Std. Dev.	Min	Max
No borrowing because information gap	2867	.4182072	.4933506	0	1

Furthermore, we selected a range of independent variables which according to the research in Phase 1 and according to a broader understanding of the dynamics of agri-finance in Tanzania were assumed to be potentially relevant correlates of the respective dependent variables:

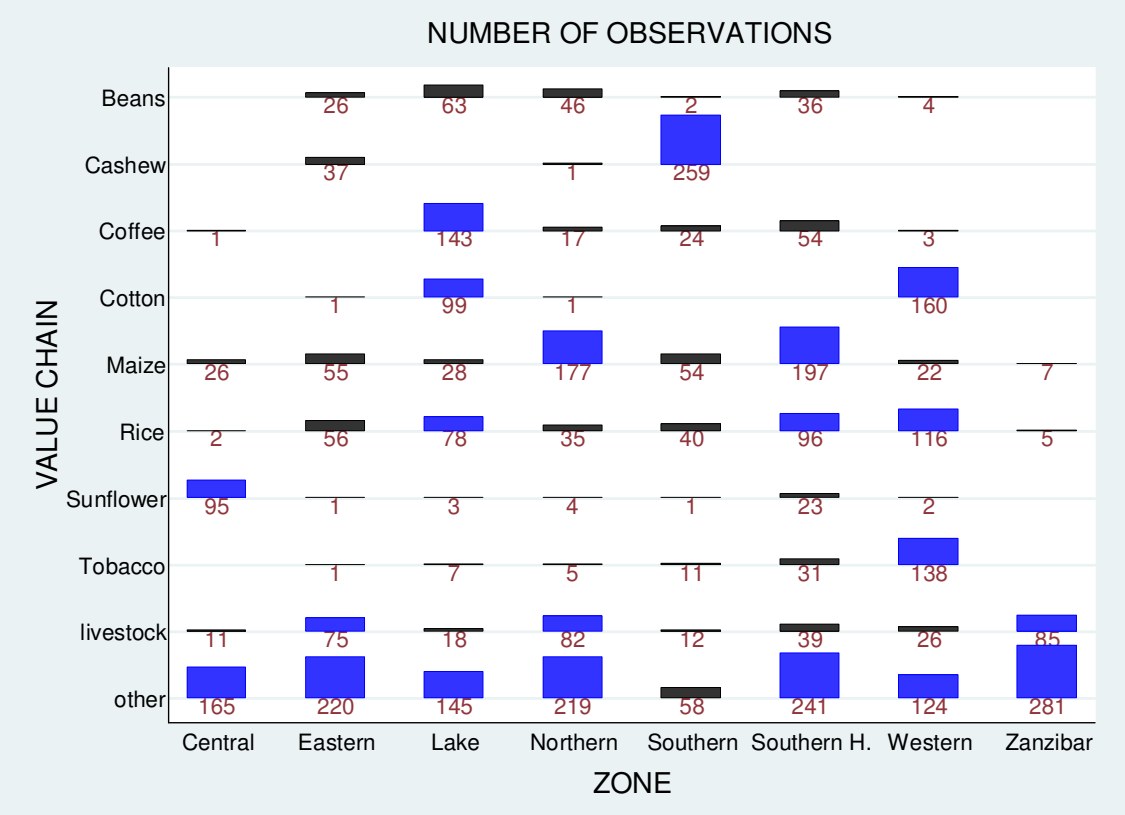
1) Whether someone has a bank account, value=1 if yes and 0 if no
2) Whether someone has insurance, value=1 if yes and 0 if no
3) The number of staff, this is the sum of full-time +0.5*(part-time + seasonal)
4) Whether someone has a title deed, value=1 if yes and 0 if no
5) The number of different crops a farmer grows, aside from the main crop
6) Whether the farmer is male or female, value=1 if male and 0 if female
7) The age of the farmer
8) The age of the agri-business
9) Whether the farmer has had secondary education (or higher), value=1 if yes and 0 if no
10) The number of people dependent on the income of the agri-business
11) Whether the farmer has a cell-phone, value=1 if yes and 0 if no
12) Whether the farmer is member of a group, value=1 if yes and 0 if no
13) Whether the farmer keeps financial records, value=1 if yes and 0 if no
14) Whether the business is registered, value=1 if yes and 0 if no

4 Results Phase 1

The AgFiMS demand survey consists of 17 chapters which we analysed in 4 focus areas:

a) Business characteristics: *types of agricultural activity, age & gender of business owner, etc.*
b) Access to non-financial services: *infrastructure, land, group, extension services, markets, etc.*
c) Access to financial services: *financial literacy, use of saving, credit, insurance, bank accounts, etc.*
d) Turnover and growth: *turnover, perceptions of key constraints to growth, etc.*

As outlined in the methodology section, we analysed all individual questions on the level of value chains and agro-ecological zones. Each value chain and each zone contains between 130 (sunflowers) and 700 (Southern Highlands) observations in the survey, but the survey respondents are strongly clustered in particular value chain/zone combinations, e.g. for the cashew value chain most respondents are from the Southern zone, whereas for the sunflower value chain most respondents are from the Central zone. For typical food crops – beans, rice & maize - the respondents are spread a bit more over the various zones. The spread of the survey respondents over value chains and zones is shown below.



NB: The blue bars reflect those sample sets with at least 70 observations per zone/value chain combination; this somewhat arbitrary cut-off point was chosen to highlight the most significant sample sets.

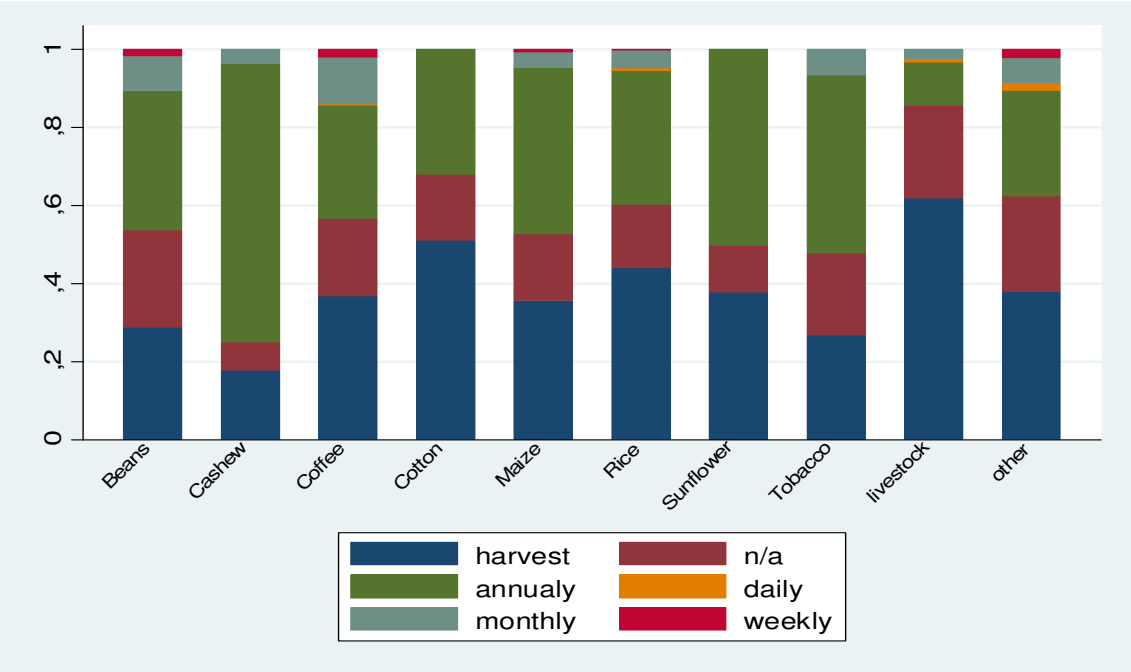
From the analysis of the four focus areas mentioned above we then extracted the most relevant and noteworthy results.

4.1 Business Characteristics

1. <u>Income and Crop Cycle Interlinked</u>

How often a farmer receives income, depends on the type of crop he/she grows. For instance, most cashew farmers get their income once a year (unless they process and/or store the cashews for sale at a later stage), whereas in the livestock sector income is more continuous (i.e. on-going sales of milk, meat, etc.). These differences are relevant for design of financial products as these have to meet the particular cash flow

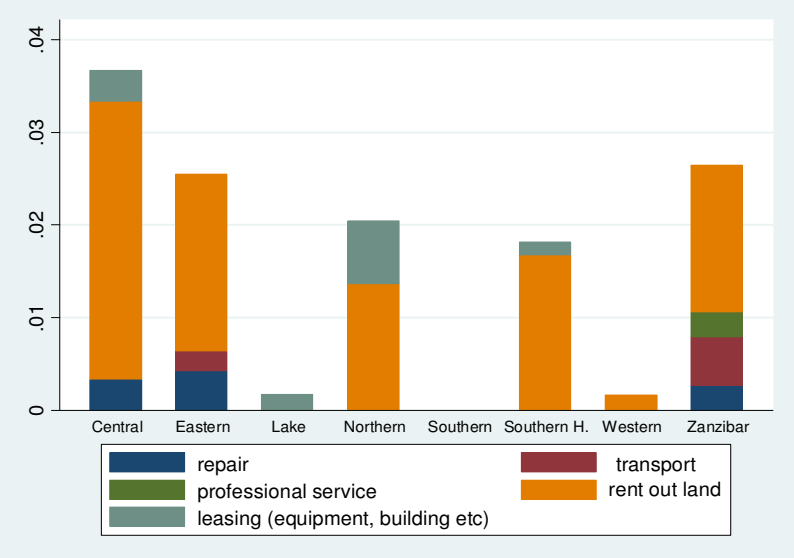
requirements of the specific value chain, i.e. a savings product for cashew farmers so they can save some money for the next season or a warehouse receipts scheme to obtain better prices.



NB: The vertical axis represents the (cumulative) fraction of observations per respective category. For example, about 30% of bean farmers receive their income at harvest time, about 25% receive their income during at an unspecified time (n/a), etc.

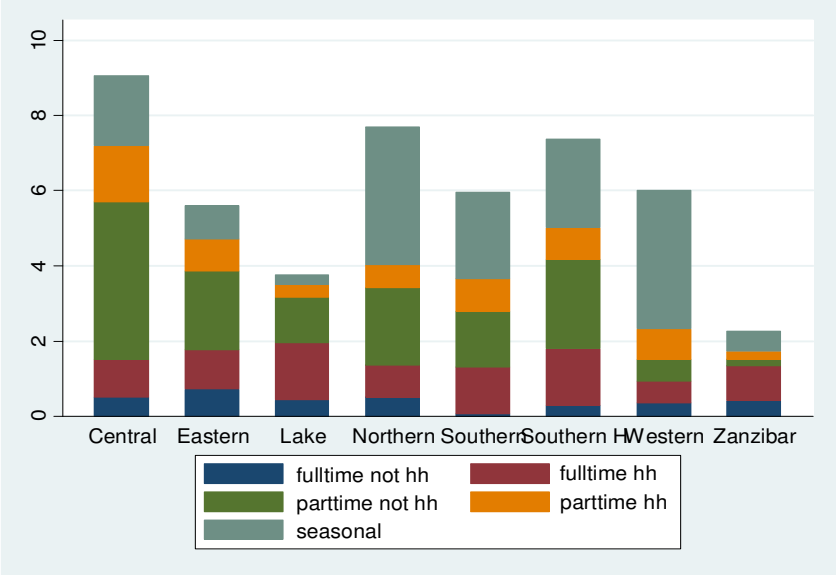
2. Variation in Level and Type of Services Provided

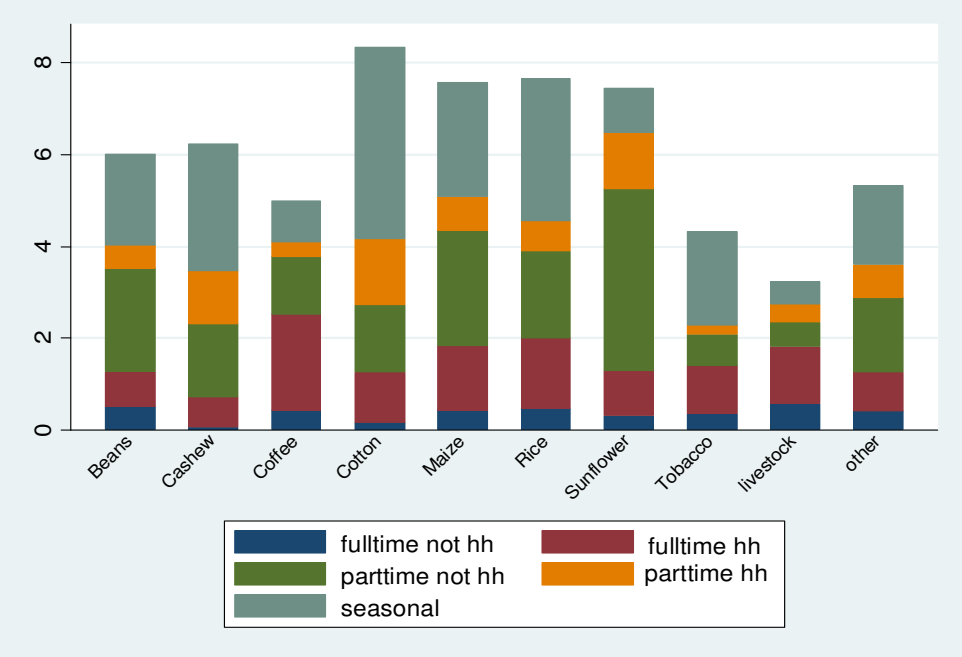
Service providers are more common in certain zones (Eastern, Western and Zanzibar). Renting out land is the most common 'service' provided, followed (at a considerable distance) by leasing of equipment.



3. Variation in amount and type of human resources

There is substantial variation in number of staff per business between zones and value chains. Furthermore, the type of labour employed differs strongly between zones and value chains. These differences are relevant to financial access since the amount and type of labour employed by a business can affect both its need for finance (to hire workers) as well as its productivity, and as a result its capacity to access financial services.

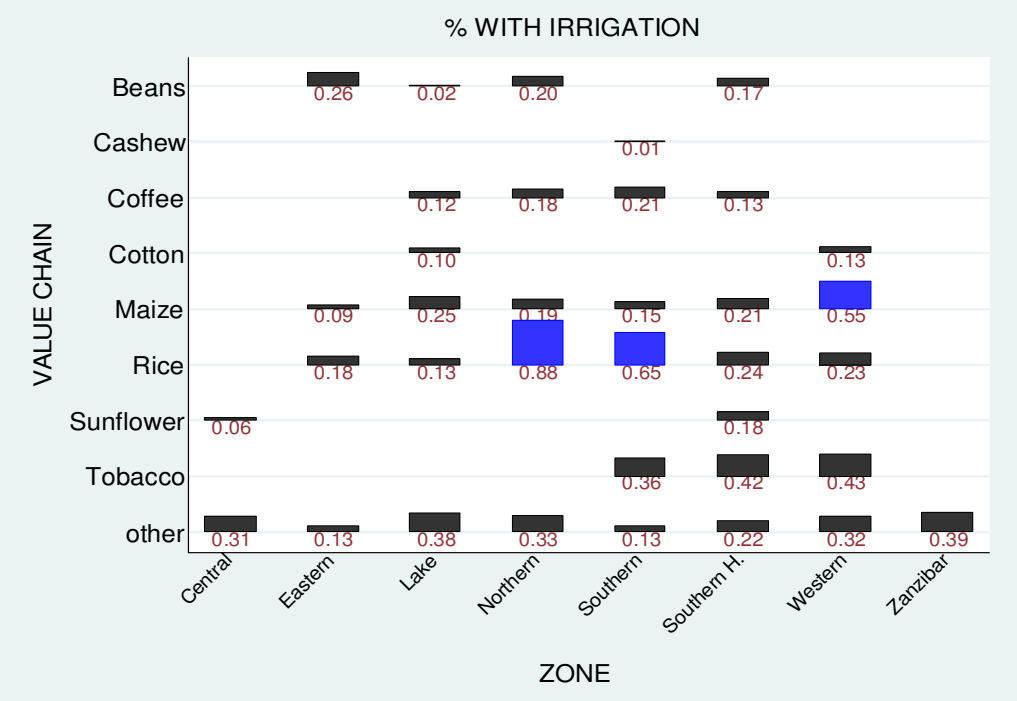




4.2 Access to non-financial services

1. <u>Limited Access to Irrigation</u>

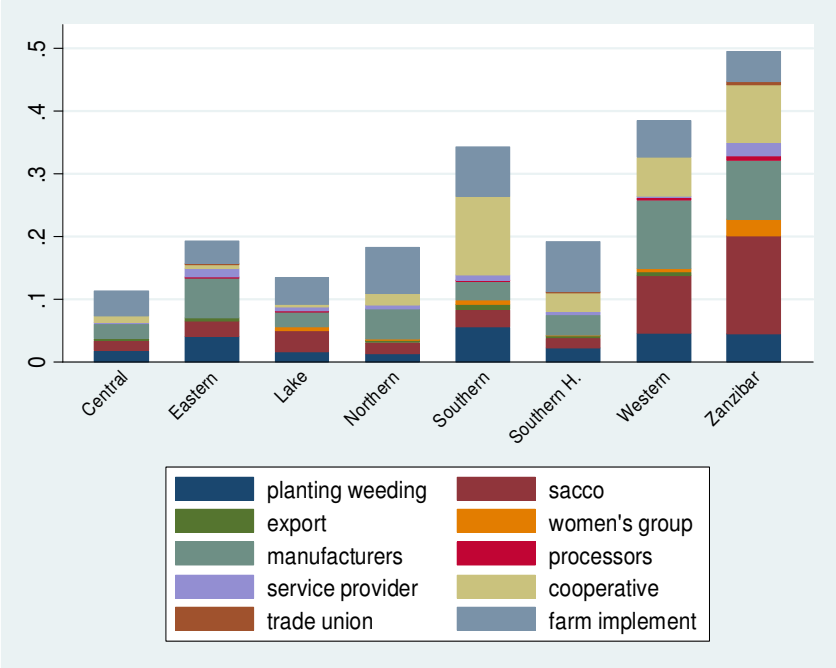
Most businesses have no irrigation schemes. Exceptions are rice farmers in Northern and Southern zones and maize farmers in Western zone, with 88%, 65% and 55% resp. having an irrigation scheme. Access to finance (saving and credit) may be a way to increase access to irrigation.



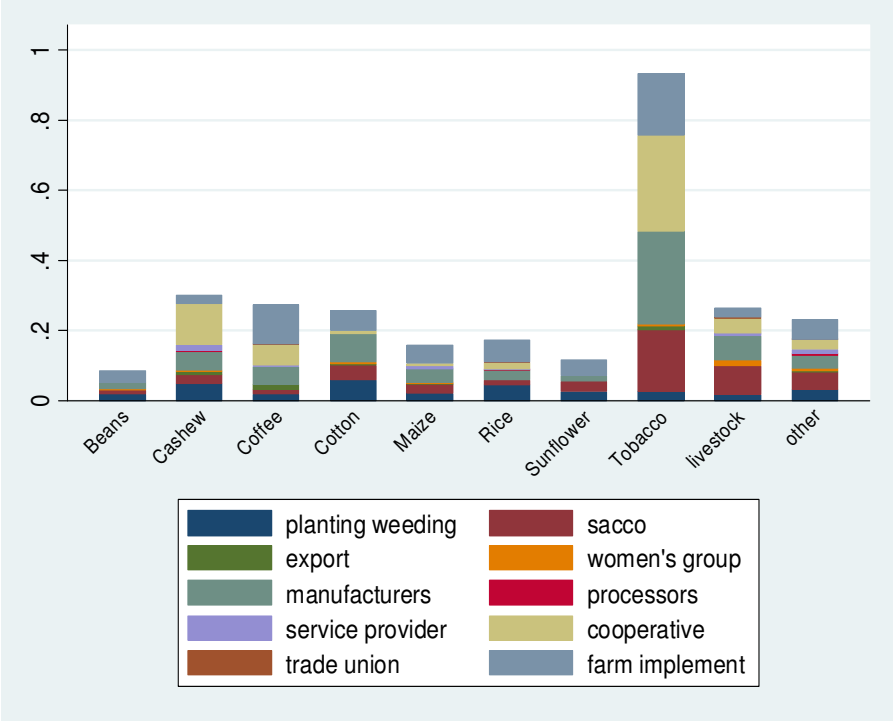
NB: The blue bars reflect those zone/value chain combinations in which at least 50% of the farmers have irrigation.

2. Levels and Types of Group Membership

The number of businesses that belong to some form of agricultural group differs between zones and value chains, rates are highest in Southern, Western and Zanzibar and among tobacco farmers. Furthermore, the type of groups to which they belong differs as well. For instance, SACCOs seem to be more common in Zanzibar whereas cooperatives are more prevalent in the Southern zone[5].

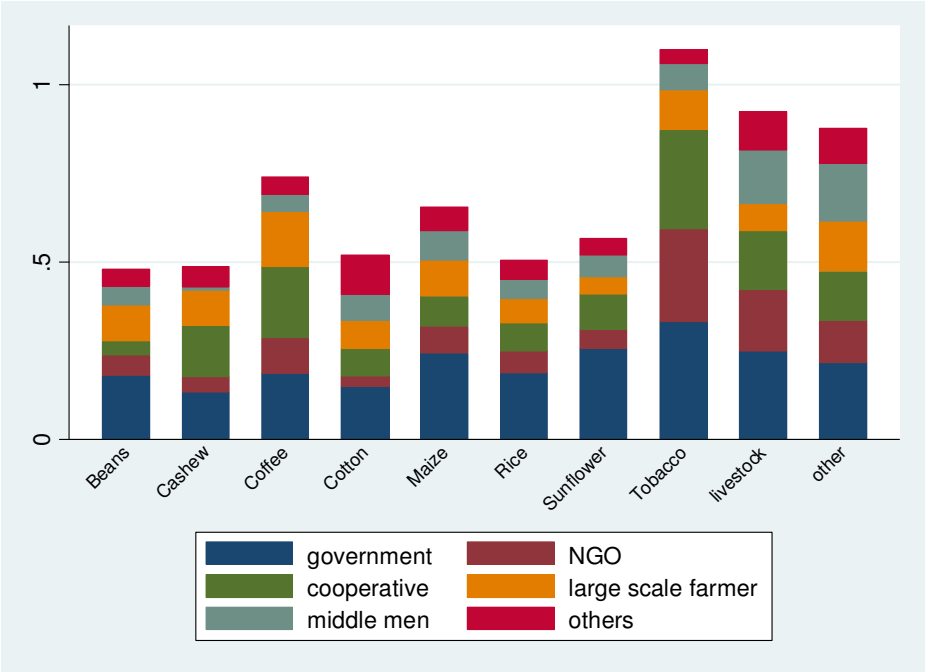


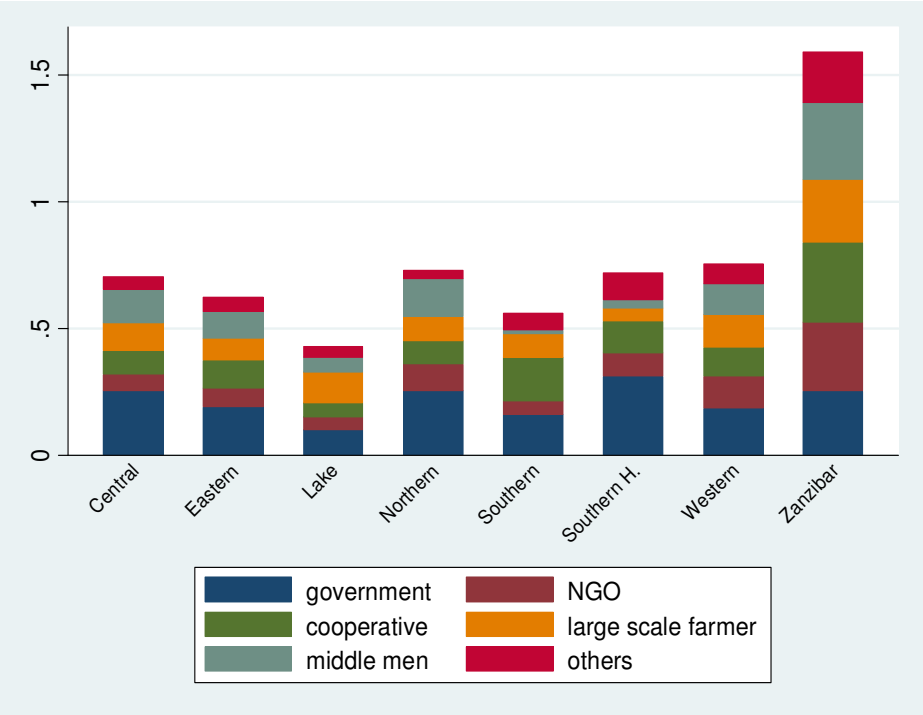
[5] Although there is a higher number of SACCOs per capita in Zanzibar than on the mainland, the average number of members of SACCOs on the mainland is about twice as high (see AgFiMS Supply Side Report, Ayani). Thus, we assume this finding is mainly due to sample selection.



3. Levels and Types of Extension Services Received

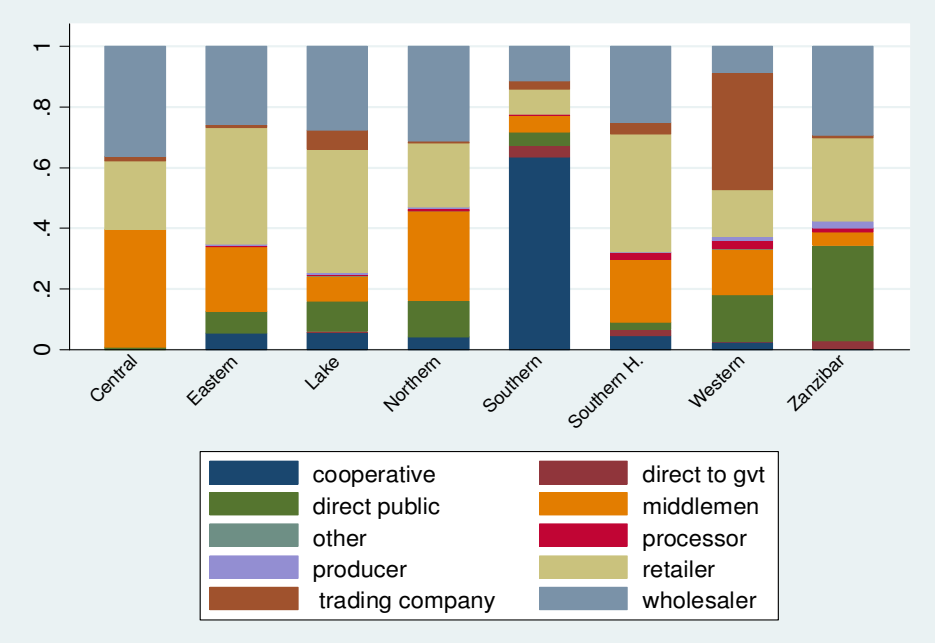
There are substantial differences in the number of agri-businesses that receive extension services among the different value chains and zones. In tobacco and livestock value chains and in Zanzibar relatively many businesses receive extensions services. Most extension services are provided by the government, followed by cooperatives, large farmers and NGOs, with only slight variations across value chains and zones.

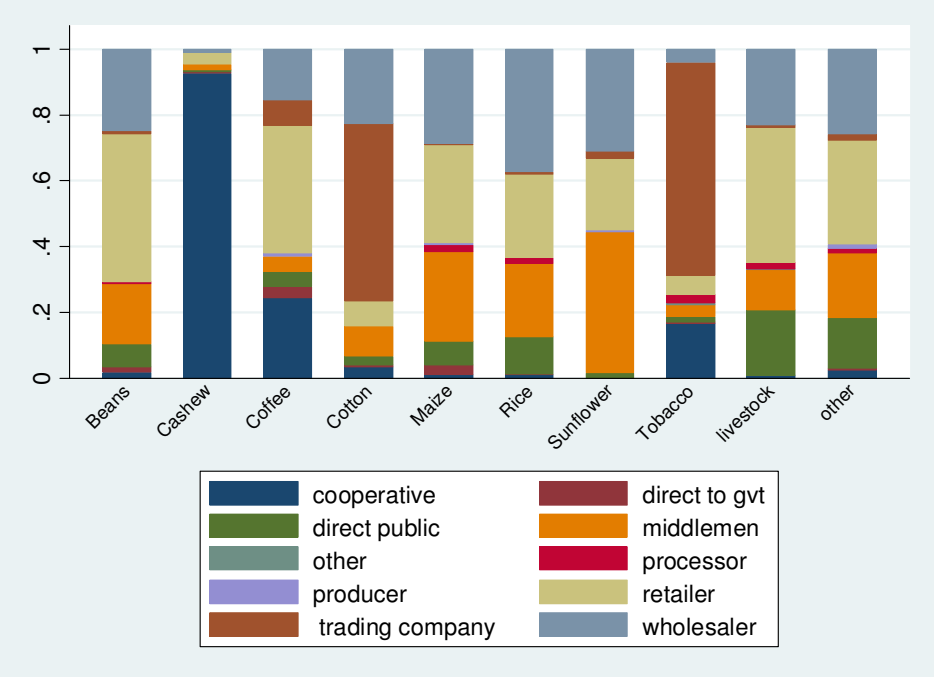




4. Difference in types of sales channels

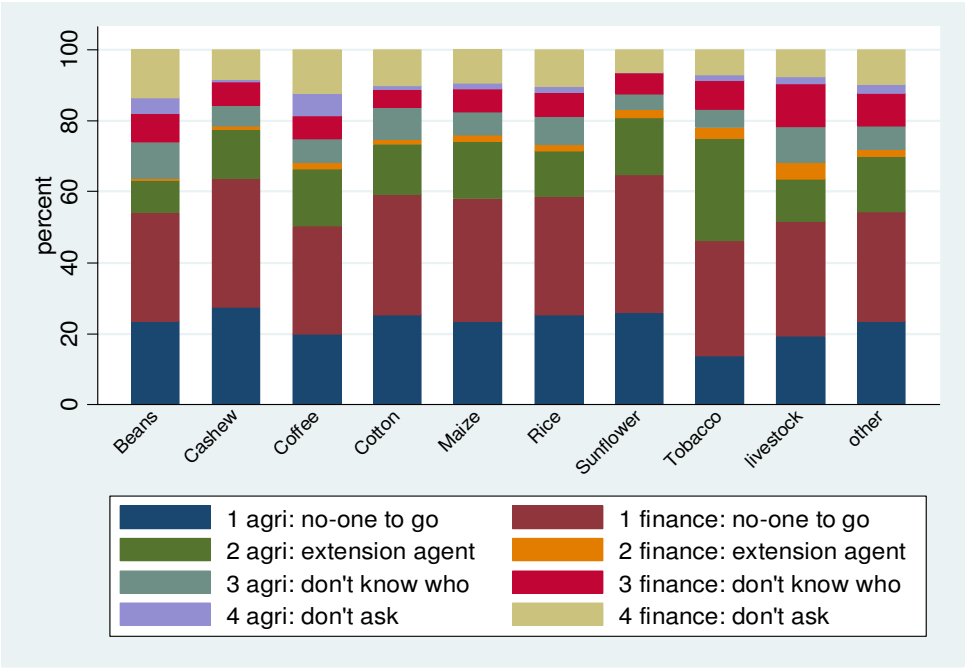
Middlemen, retailers, wholesalers and to a lesser degree cooperatives and direct sales are the most common sales channels. Notable differences are (i) the Southern zone/cashew value chain where cooperatives are the dominant sales channel and (ii) the Western zone/cotton & tobacco value chains, where trading companies are the most commonly used sales channel.

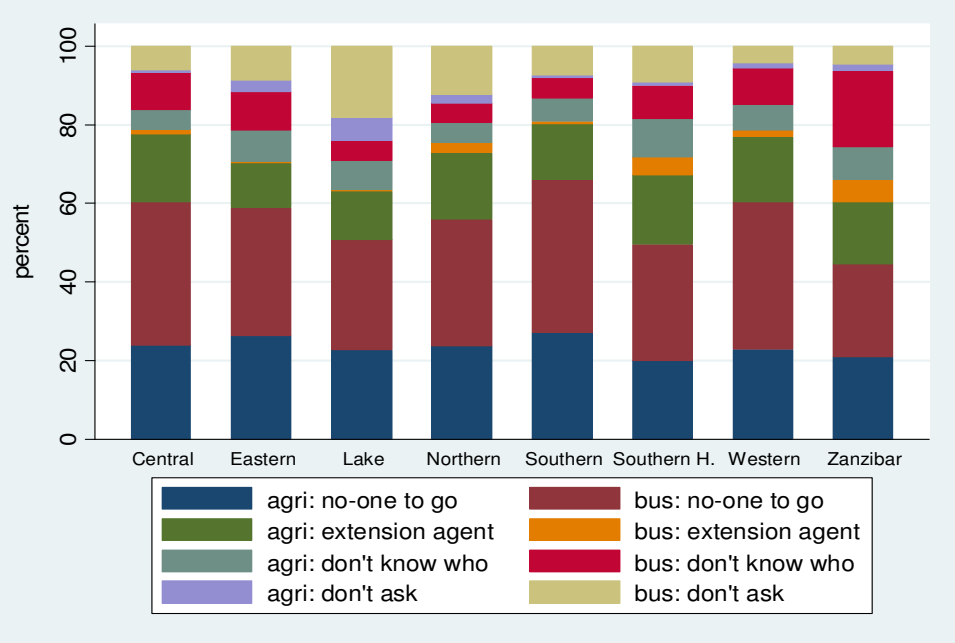




5. Lack of Information on Business and Finance

We find that when it comes to obtaining information on business and finance across value chains and zones, most agri-business either (i) think there's no-one to go to or (ii) don't know where to go. This suggests the need and importance for additional business development and other types of support services.

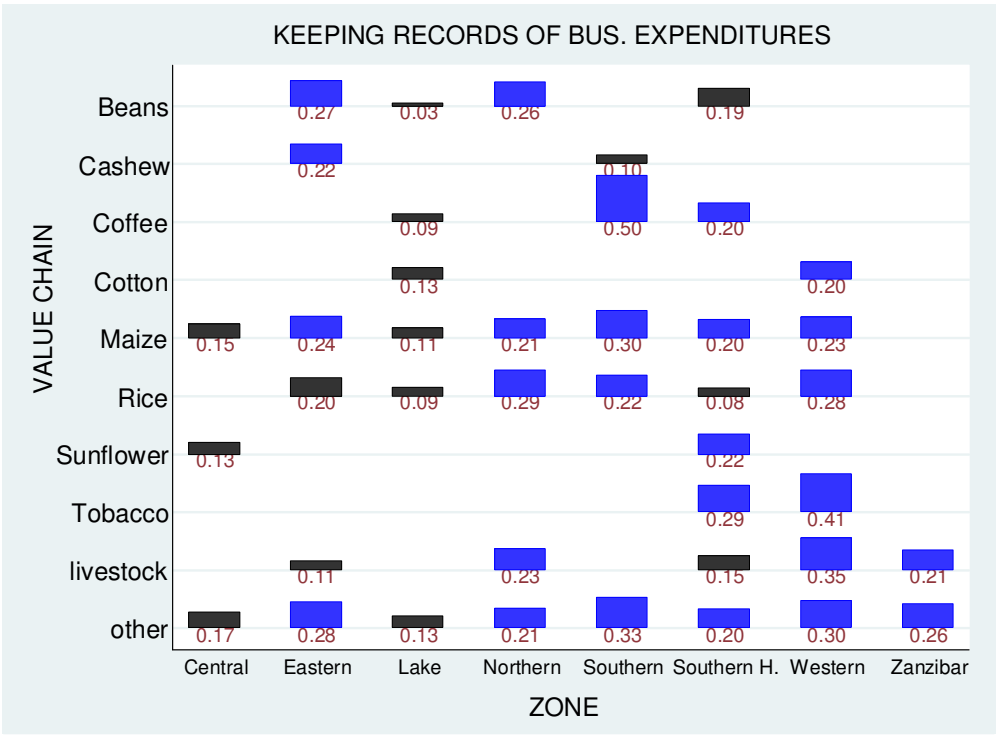




4.3 Access to financial services

1. Financial Literacy / Financial Record-keeping

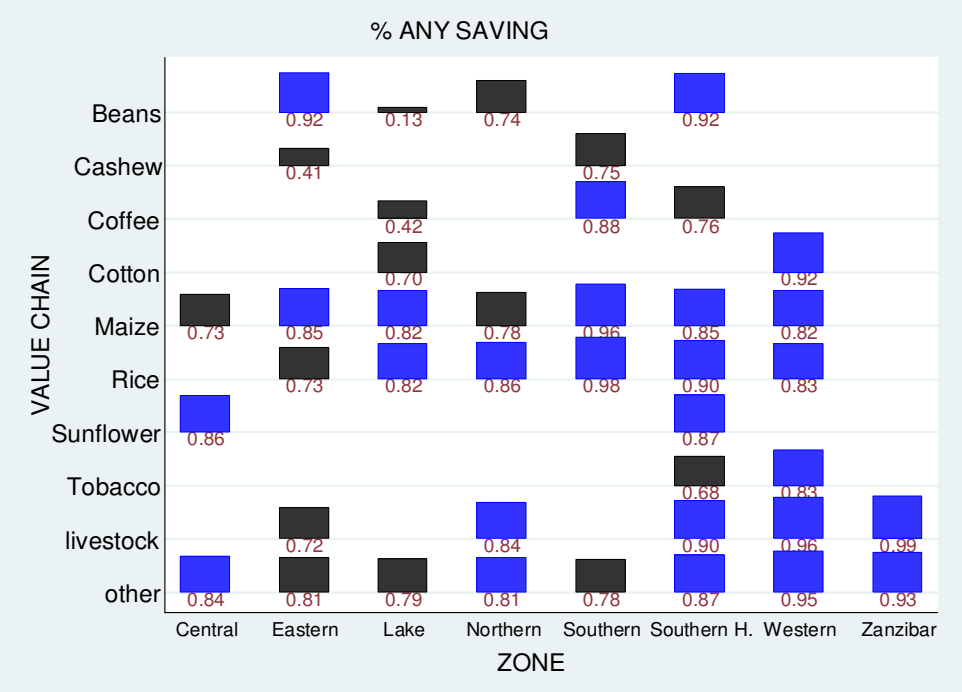
In the graph below we see that the percentage of businesses that keep **records of their business expenditures** differs substantially between zones and value chains. For example, 27% of bean farmers in Eastern zone keep such financial records, as opposed to only 3% of bean farmers in the Lake zone.



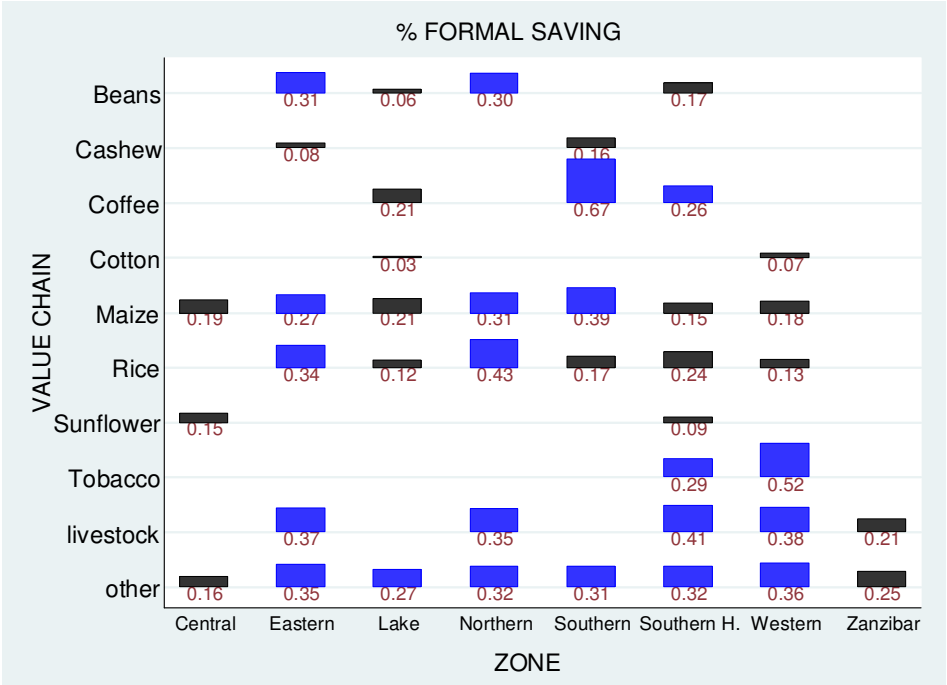
NB: The blue bars reflect those zone/value chain combinations in which at least 20% of the farmers keep records of their business expenses.

2. Formal Saving

About 80% of farmers engage in some form of saving. There is substantial variation between zones and value chains. For example, only 13% of bean farmers in Eastern zone report that they save, as opposed to 88% of coffee farmers in the Southern zone. Less than half of these farmers, only about 25% of the survey sample, save with formal institutions (bank, MFI, SACCO)[6]. Again, these rates differ substantially between zones and value chains.



NB: The blue bars reflect those zone/VC combinations in which at least 80% of the farmers engage in any form of saving.

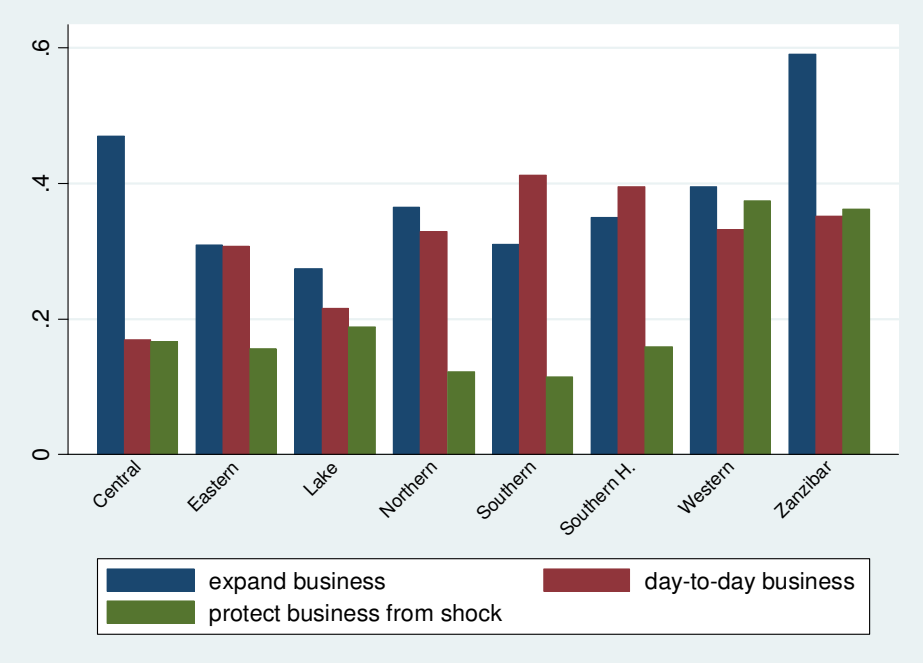


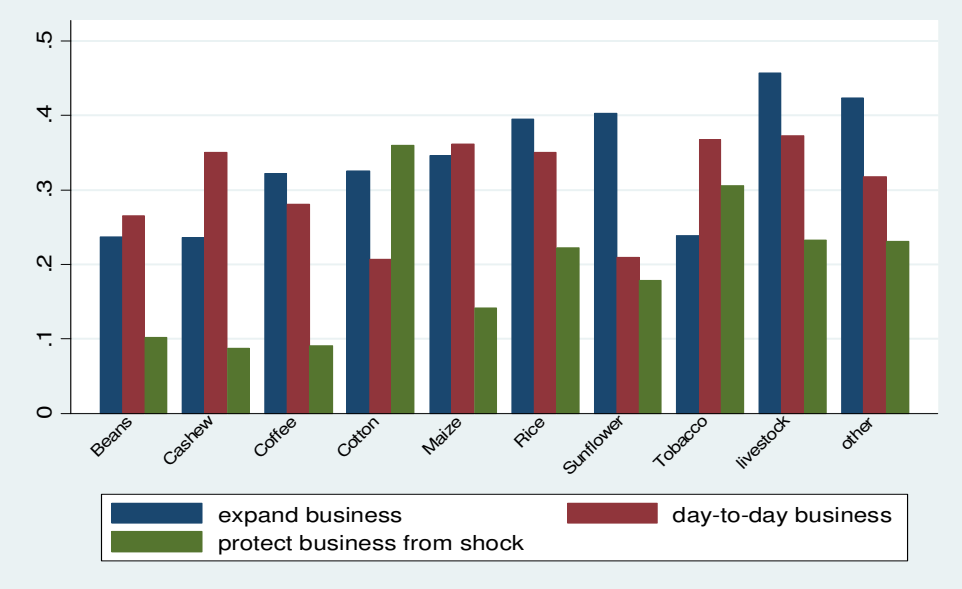
NB: The blue bars reflect those zone/VC combinations in which at least 25% of the farmers engage in formal saving.

[6] The "demand-side report" mentions 29%, but this is due to a different definition of formal saving.

Expansion of the business is the most common reason for saving (about 45%) followed by covering day-to-day expenses (about 40%) and protecting the businesses from a shock (about 25%)[7]. This suggests that farmers are willing to expand their businesses and hence better financial services could help them do even better.

Furthermore, there are different motivations for saving between zones and value chains. For example, expanding the business is the main motivation for saving in the Central zone, whereas covering day-to-day expenses is the primary reason for saving in the Southern Zone.

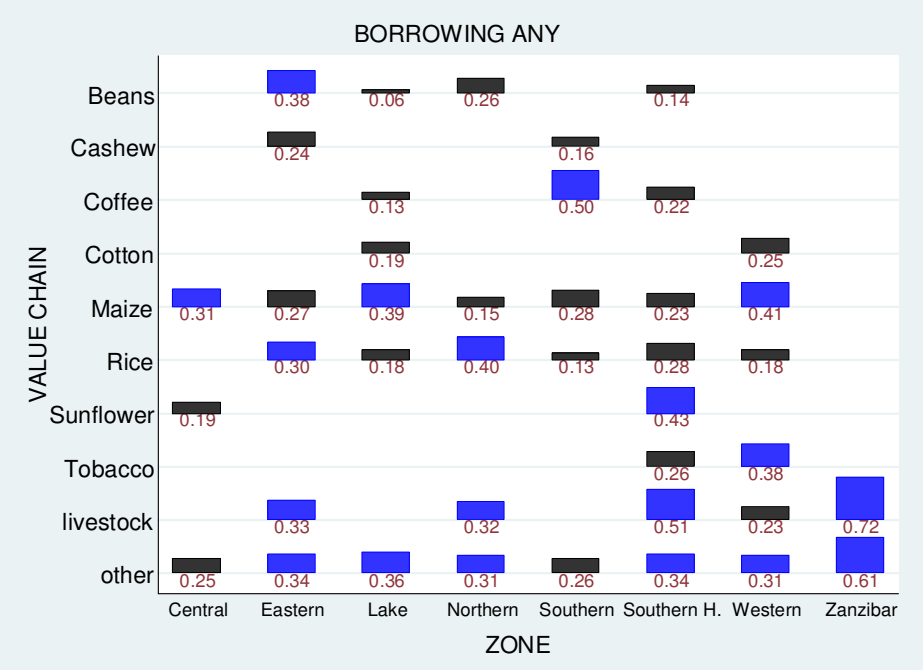




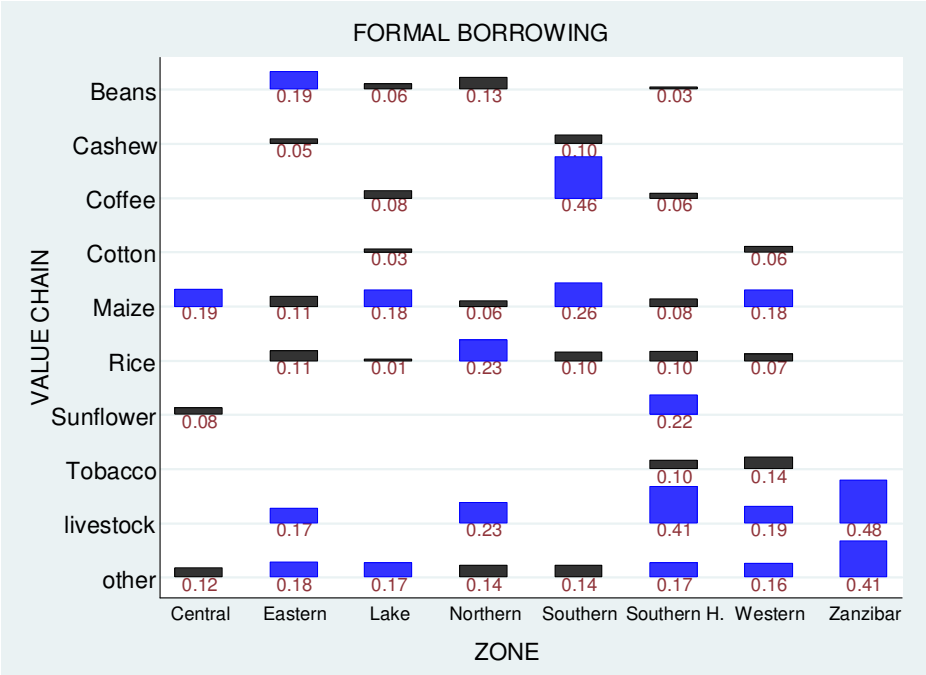
[7]Only 3310 persons answered this question, just over 80% of the total sample.

3. Formal Borrowing

Around 30% of the sample engages in some form of borrowing. Of these, around half (i.e. 15% of the total sample) borrow from formal institutions (bank, MFI, SACCO). Once again, these rates differ substantially between zones and value chains. For example, overall borrowing rates – formal and informal – among coffee farmers in the Southern zone are around 50% as opposed to 15% for maize farmers in the Northern zone. Similar differences are observed for formal borrowing: 45% of coffee farmers in the Southern zone borrow through formal sources, as opposed to 7% of rice farmers in the Western zone.



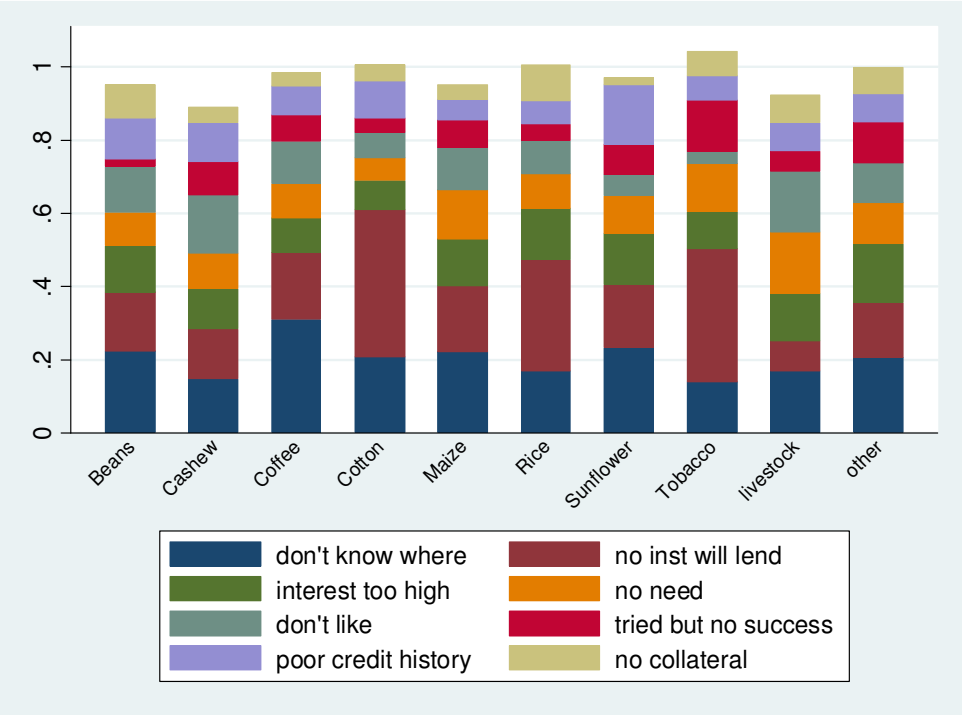
NB: The blue bars reflect those zone/VC combinations in which at least 30% of the farmers engage in any form of borrowing.



NB: The blue bars reflect those zone/VC combinations in which at least 15% of the farmers engage in formal borrowing.

Furthermore, lack of information constrains many businesses to borrow from formal sources. Across value chains and zones we observe that between 30% and 60% of businesses do not borrow through formal financial institutions because:

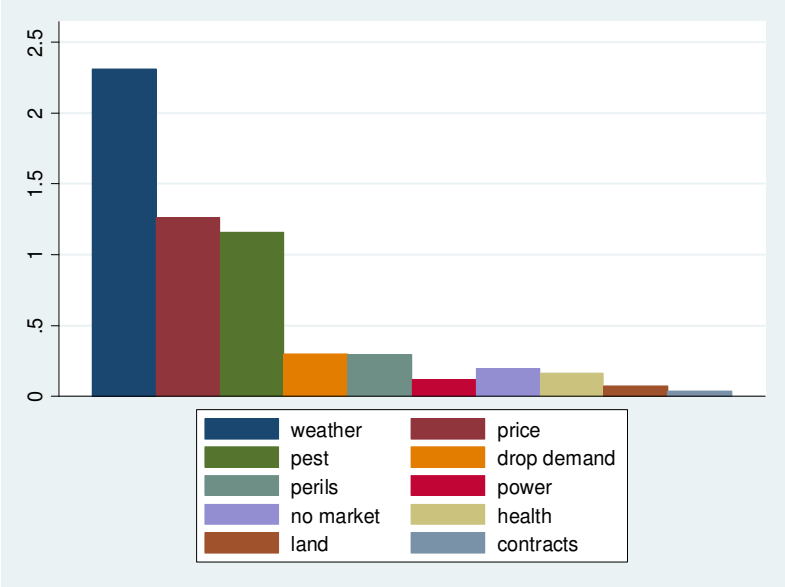
(i) they do not know where to find such institutions or
(ii) they have the experience/perception that these formal institutions will not lend to them anyhow.



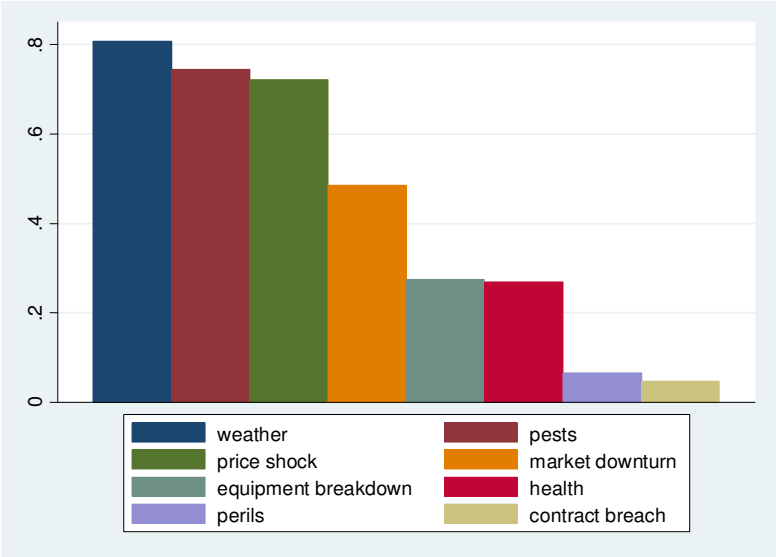
4. Insurance

Most businesses do not only *perceive* weather to be the greatest risk, but they also *experience* weather as the main risk: around 80% of agribusiness faced a weather shock in the last 5 years.

Graph 4.1.1 Risks: perceived impact

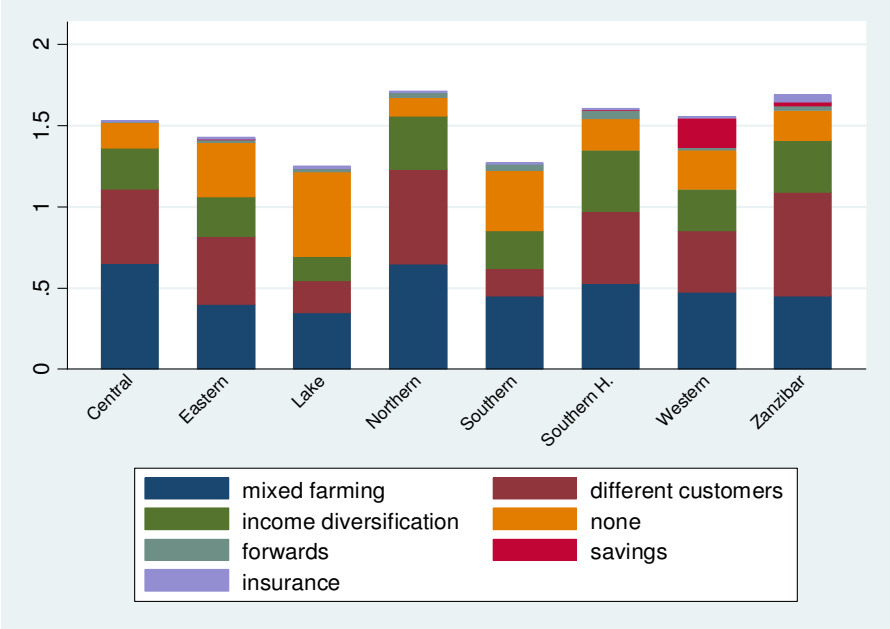


Graph 4.1.2 Risks: actual impact

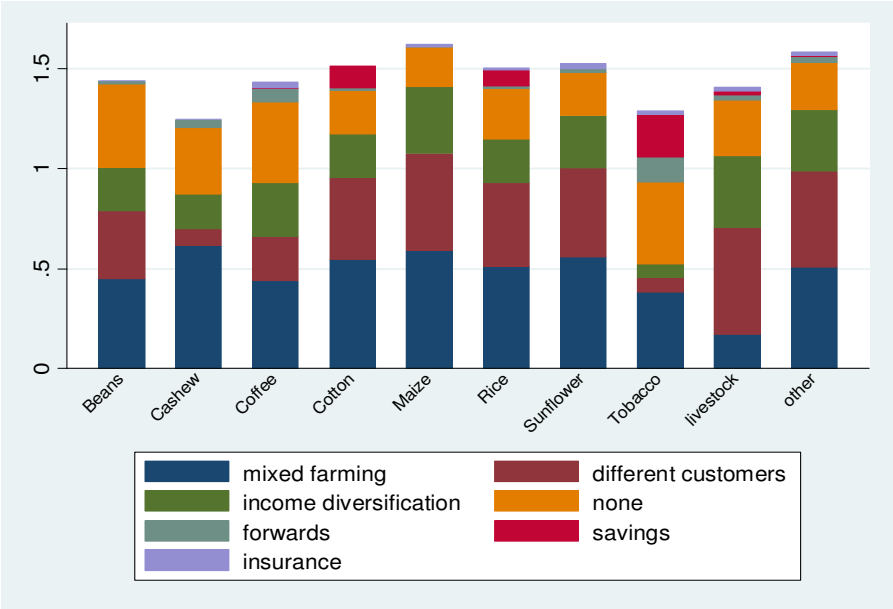


Note: Graph 4.1.1 shows how respondents rank the severity of the various risks they face. Farmers were asked to assign the 3 gravest risks. The biggest risks was assigned a value 3, the second biggest risk a value 2 and the third biggest risk a value 1. Graph 4.1.1 shows the averages of these values for the full sample. For example, for weather this value is 2.25, indicating that most farmers perceived weather to be the greatest risk (value=3) or second greatest risk (value=2).

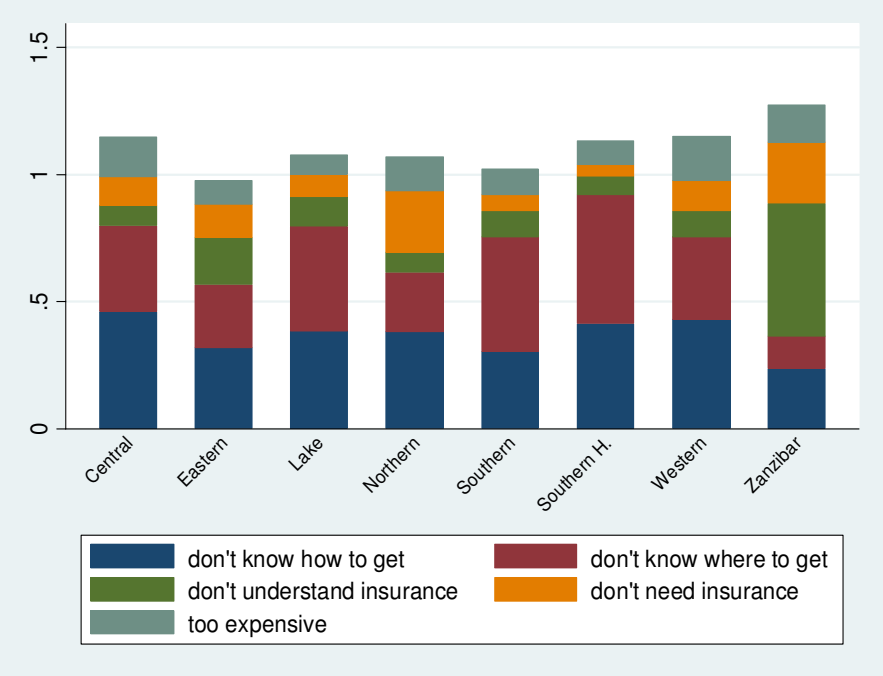
Insurance is rarely used as a risk mitigating strategy: informal mechanisms such as mixed farming, having multiple customers or having multiple sources of income are more common ways to hedge risks. As can be seen in the tables below the following are most commonly applied as (financial) risk management strategies: "mixed farming", "having different customers" and "having different income sources".



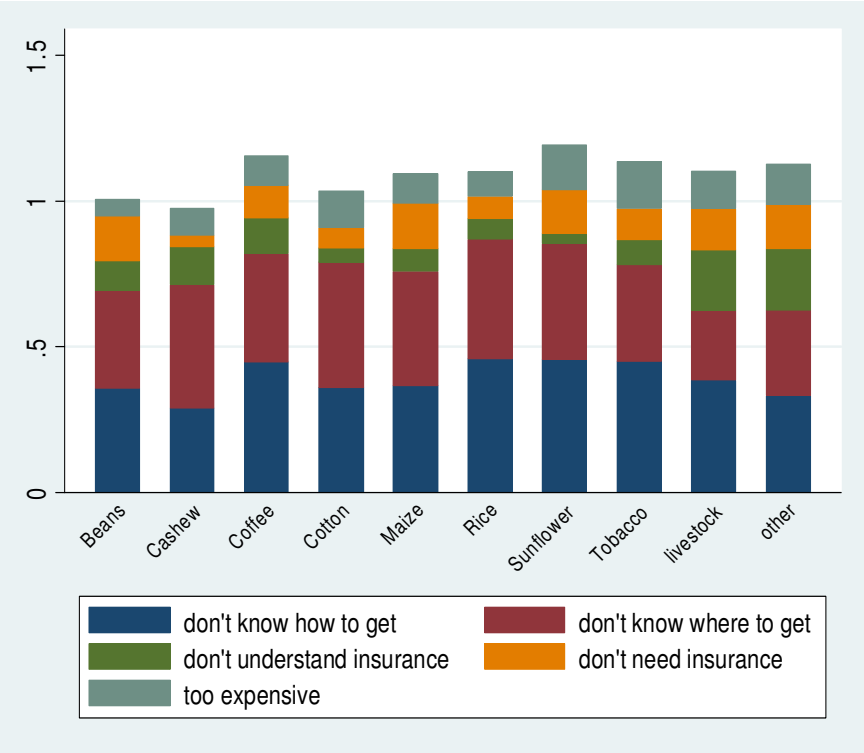
Note: The graphs above and below show the cumulative fraction of respondents that apply various risk management strategies. For example, around 60% of the businesses in Central zone used mixed farming, and 50% try to reduce their risk by having different customers, etc. As can be seen in the graph, only a few percent of the respondents use insurance (light blue) to hedge risks. Respondents could mention more than one risk management strategy, so the totals do not add up to 1.



Lack of information is the most commonly mentioned reason for businesses not to obtain insurance, just like we saw with regards to access to formal finance.

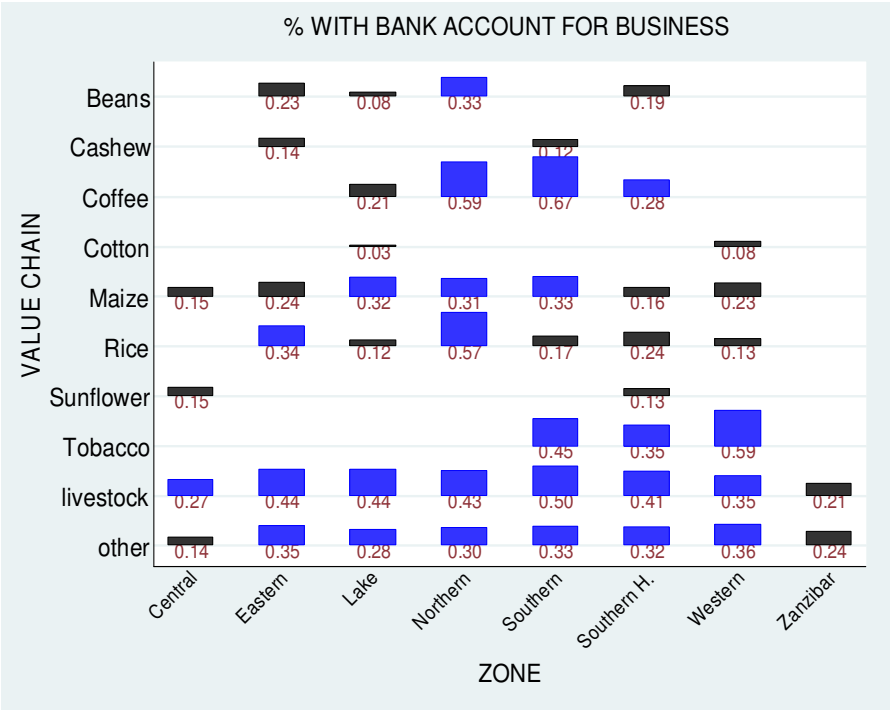


Note: The vertical axis represents the cumulative fraction of respondents per category. For example, nearly 50% of farmers in the Central zone don't know how to get insurance, and another 30% don't know where to get it, etc.



5. Bank Accounts

Around 25% of businesses have a bank account. These rates differ substantially between value chains and zones, as we can see in the diagram below.



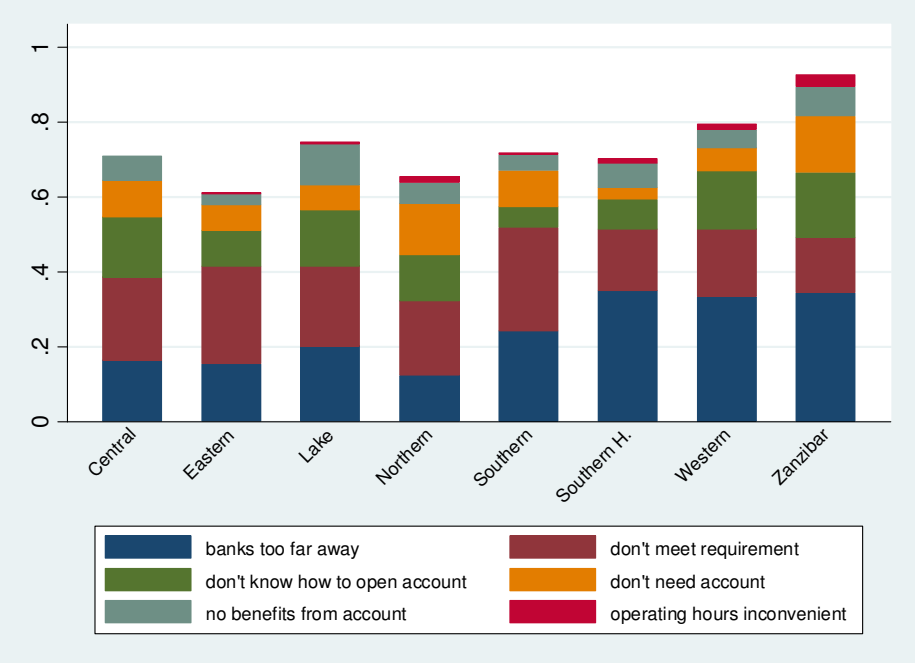
NB: The blue bars reflect those zone/VC combinations in which at least 25% of the farmers have a bank account.

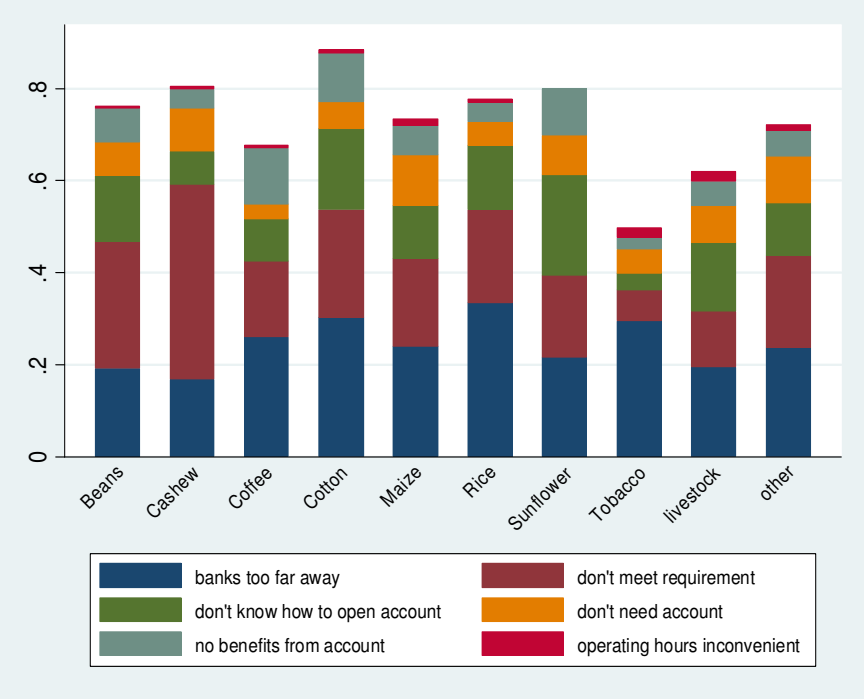
The main reasons for not having a bank account are:

(i) distance to the bank;

(ii) producers do not meet the bank's requirements or expect not to be able to meet them;

(iii) producers do not know how to open a bank account.

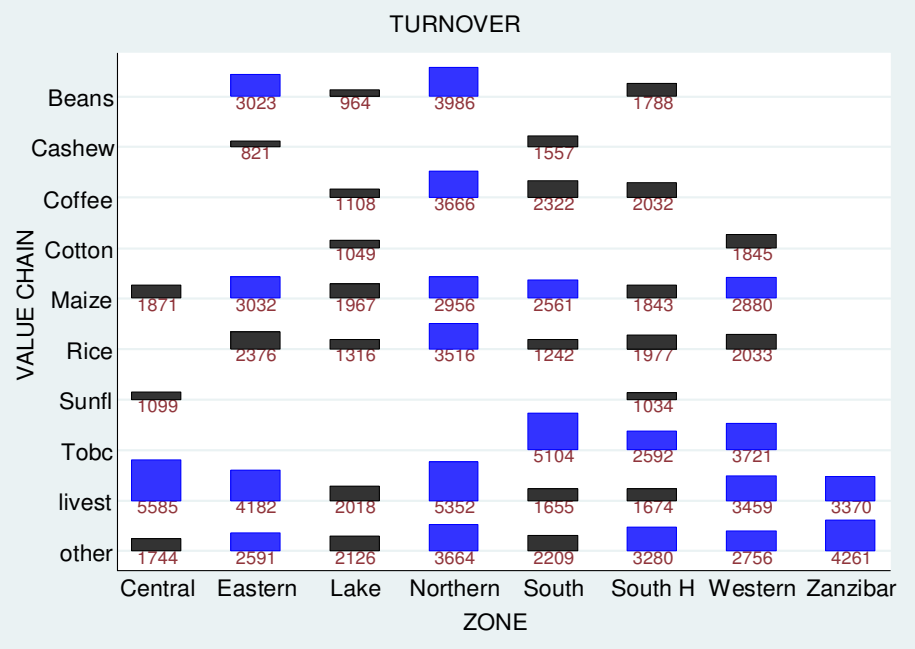




4.4 Turnover and growth

1. <u>Substantial Variation in Turnover</u>

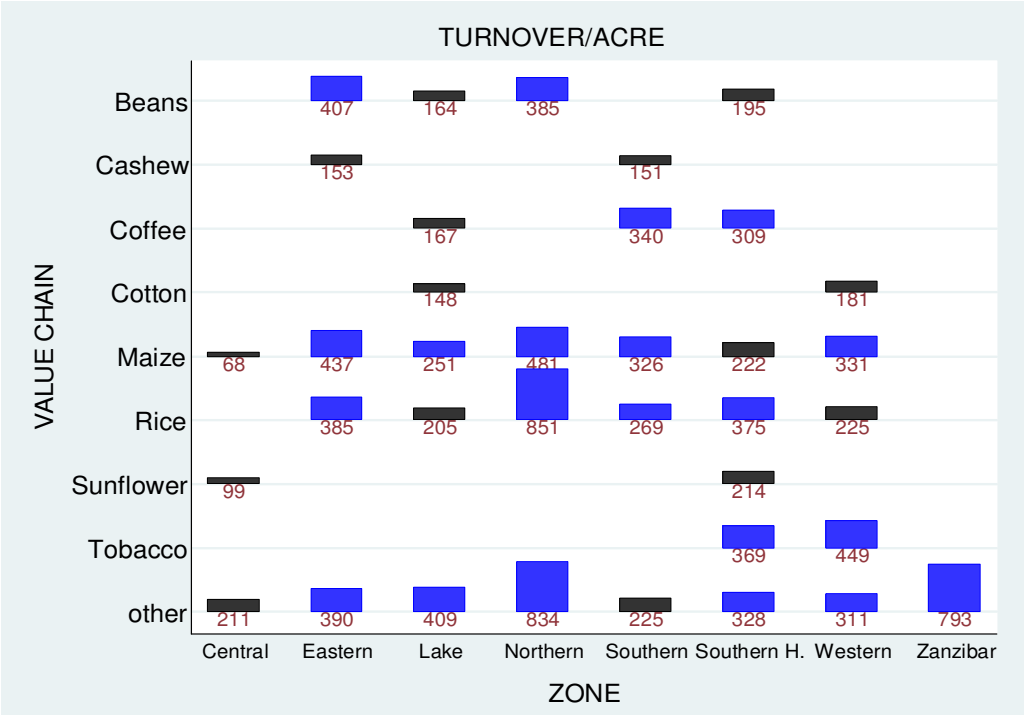
Both average turnover and turnover per acre of land used differ substantially between zones and value chains. Average turnover is 2.5 million TZSh and average turnover/acre is 0.5 million TZSh. It should be noted that turnover/acre is not necessarily an accurate indicator of productivity, because turnover is the product of yields and price which may fluctuate substantially over time and space. However as no price information was collected in the survey, we can only use turnover/acre as a *proxy* for productivity.



NB: The blue bars reflect those zone/VC combinations in which average annual turnover of farmers is at least Tzs 2.5 million.

The price factor plays a particularly strong role for cash crops such as coffee, in which case there is also a big price difference between *Arabica* – mainly grown in the Northern and Southern (Highlands) zones - and *Robusta* coffee – mainly grown in the Lake zone. This explains the big difference between the productivity per acre for coffee farmers in the Southern and the Southern Highlands zones on the one hand and the Lake zone on the other hand. The former is about twice as high as the latter which is more or less the price difference between *Arabica* and Robusta coffee[8].

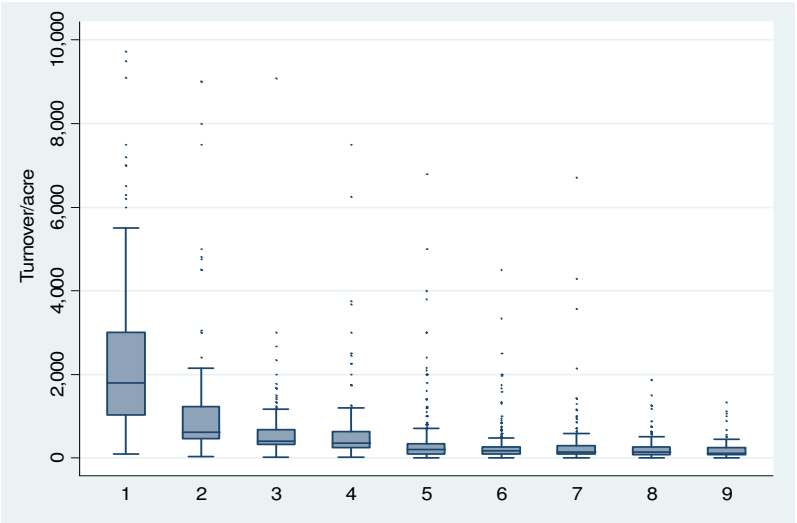
[8]The Northern zone is not represented in the diagram below as the sample was too small. The difference between the average turnover in the North and the South can either be attributed to the average size of the plots or price fluctuations for the same type of coffee, i.e. *Arabica*.



NB: The blue bars reflect those zone/VC combinations in which ave. annual turnover/acre of farmers is at least Tzs 250,000.

Interestingly, the producers in our survey that use smaller plots of land have a higher turnover per acre than those using larger pieces of land. A possible explanation for this surprising outcome is that farmers with access to more land lack the resources to make optimal use of this land.

*The diagram on the right shows the number of acres of land used on the horizontal axis and the median turnover/acre (*1000TZSh) on the vertical axis. The middle of the box shows the value of the median, the ends of the boxes show the 25th / 75th percentile (half of all observations – the mid-range - fall within the box) and the 'whiskers' show the remaining 24.65% of observations on both sides of the box (1.5 times the so-called 'inter-quartile range', and the dots represent the outliers.*



5 Results Phase 2

In the 2nd phase we conducted various regression analyses to look at the drivers of several key issues identified during the previous phase.

5.1 Turnover/acre

With the ultimate aim of improving the livelihood of agri-businesses in Tanzania we looked at how various factors, including the use of financial services, are related to the turnover levels of farmers. We also analysed how these relationships differ between value chains and agro-ecological zones. Our regression analysis, the results of which are shown in tables 5.1 and 5.2, show that several factors correlate strongly with turnover per acre:

(i) Formal saving: Business that hold formal savings tend to have higher turnover/acre. This holds for most value chains and zones, except the cotton and rice value chain and the Eastern zone[9].

Recommendation:	*Although it is not possible to determine that there is a causal relationship, it makes sense to promote savings as a way to stimulate higher turnover/acre, starting with maize, beans, coffee and/or cashew farmers. In order to determine causality we would need to identify trends, which is only possible if we dispose of data for time series. Instead of waiting for the next opportunity to carry out a country-wide survey, a pilot project on a smaller scale targeting one or two crops in a limited area could be set up. For instance, coffee farmers in Southern Highlands or cashew farmers in the Southern zone.*

(ii) Land size: In most value chains and zones producers that use more land have lower turnover per acre. As we mentioned above, a plausible explanation for this unexpected finding is that producers with access to more land lack the resources to take full advantage of this land. More in-depth data is necessary to verify this explanation[10].

Recommendation:	*Regardless of causality it makes sense to target relatively smaller businesses - in terms of acreage – as these have higher 'productivity'. However, at the same time there may also be potential benefits from targeting farmers with access to larger plots of land who currently under-utilize this land for lack of finance to buy inputs or invest in better production methods that increase yields.*

(iii) Business age: There is a negative relation between the age of the business and the turnover/acre for the sample as a whole, and in particular for tobacco and the Eastern and Lake Zones.

Recommendation:	*Financial institutions would do well to target businesses with relatively young owners (younger than 40 years old) as well as businesses with higher turnover per acre (typically business with relatively small plots of land (up to 5 acres).* *Of course, this rule of thumb should not be applied indiscriminately. However, it is an interesting finding as FIs tend to have a preference for older clients and to shy away from produces with smaller plots of land.*

[9] A possible explanation for this is that cotton and rice farmers that do not save formally use this money to buy inputs or irrigation equipment. In the case of cotton farmers informal saving rates are relatively high.

[10] Exceptions where this relation is non-significant are the beans and cotton value chain and the Western zone.

Table 5.1: Turnover/acre, per value chain

Turnover/acre	FULL	Beans	cashew	coffee	cotton	maize	rice	sunflower	tobacco	livestock
borrowing formal	-0.937	-5.515	66.98***	-206.2	53.15	-46.34	-91.64	287.9	-76.92	126.7
saving formal	80.80**	282.1*	265.1***	265.9**	-784.4*	160.3*	-776.0**	7.251	88.79	-1,835
bank account	75.49	247.8	-103.6**	13.41	1,031***	-50.21	877.2**	32.58	154.4**	1,535
insurance	224.7	150.7*		-56.36		1,492	-170.6			-520.7
number of staff	1.034	10.83*	7.345*	5.614	0.503	1.383	-2.982	-0.199	3.963	14.38
land size in use	-5.689***	-3.385	-3.038**	-25.23**	-0.882	-4.820**	-12.18***	-1.635***	-9.541**	-68.12***
title deed	171.3	-342.1	-67.25**	-21.67	-191.7	-33.07	135.4	22.85	-108.7	506.1
landsize*title deed	-5.998	10.82	1.969**	-3.634	6.638	-1.153	-0.399	-9.505	4.617	66.63***
number crops	-35.23	-24.81	-0.540	39.07	-31.52	12.31	26.25*	18.18***	-64.69	-378.0***
male	-49.52	-32.76	-39.97	144.7**	31.39	-239.9	39.60	115.3***	101.5*	895.4**
age	0.0677	-4.413**	0.0995	2.180	0.723	-0.432***	-1.790	-4.100*	0.895**	3.932
business age	-4.509*	5.388	-1.261	2.061	-2.262	-5.657	0.326	-2.958	-22.48**	30.41**
second education	98.82	-6.425	-52.61*	320.2	550.5	-26.51	154.1	-116.3**	-38.34	-61.63
nr. dependents	-3.127	0.565	4.287***	-5.036	-0.268	3.810	-1.412	-12.02**	7.125	60.73
irrigation	298.2*	68.20	30.54	88.58	278.4	203.7**	261.5***	68.00	-103.9	
cell phone	-60.18	40.47*	4.187	3.312	70.68	-559.1	-292.4	13.79	299.1***	260.2
member of group	-35.30	73.26	42.19	-217.0	-46.95*	-187.9**	-1.064	-136.1*	184.0	-237.1
financial records	10.03	-142.0	10.49**	156.5	14.72	-36.78	3.927	38.40**	118.0**	199.2
bus. registration	56.13	-47.64	46.84	20.14	246.9**	993.5*	111.6		-407.5*	1,173**
extension services	103.7*	68.91	-32.84***	168.3	-69.70**	17.39	135.5**	25.35	243.6**	-304.5
sell individually	16.63	275.9*	-0.556	-131.0*	21.93	44.18	-285.4		-114.7	-1,302
Constant	479.0**	52.39	139.6**	-8.116	105.3	1,081	810.3**	223.0	303.6	1,566
Observations	3,341	170	293	239	259	553	421	127	193	334

Note: Green fields indicate statistically significant and positive correlations, and red fields indicate statistically significant and negative correlations (this applies to all regression tables in the document).

(iv) Irrigation: There is a positive relation between farmers that have irrigation and turnover/acre for the sample as a whole, as well as in the rice and maize value chains and the Central, Northern and Southern zone[11]. This is exactly what would be expected, but the fact that this correlation is highly significant for rice and maize farmers suggests that irrigation has a bigger impact in these crops.

Recommendation:	*Financial products that facilitate the acquisition/improvement of irrigation systems, e.g. 'irrigation saving & credit' products, are well worth considering in particular for the aforementioned value chains and agro-ecological zones. Once again a pilot project targeting a specific value chain and/or zone, e.g. rice farmers in the Central zone, could be an interesting test case.*

[11] As a matter of fact, there is a positive correlation for all value chains, except tobacco, and all zones but the ones mentioned are the only ones with a statistically significant correlation.

Table 5.2: Turnover/acre, per zone

Turnover/acre	FULL	Central	Eastern	Lake	Northern	Southern	South. H	Western	Zanzibar
borrowing formal	-0.937	-24.27	94.34	-94.11	-18.48	-12.19	9.776	-72.08	8.566
saving formal	80.8	139.2**	-104.7*	309.9*	2.742	180.7**	143.0*	6.271	359.0***
bank account	75.49	84.76	173.1**	-55.66	133.3	-3.177	99.45	239.8*	-391.3***
insurance	224.7		1,187	129.9	-582.3**	-104	-125.7		-185.6**
number of staff	1.034	-3.437	14.58	4.696	-1.115	5.048	7.584	-4.045	-53.04*
land size in use	-5.689***	-2.412*	-14.58*	-10.18*	-11.32***	-5.433**	-3.043**	-3.6	-49.19***
title deed	171.3***	-173.9	-56.51	217.1	-554.4***	56.51	400.6	95.56	141.5
land size*title deed	-5.998	-1.102	-2.998	-35.37	17.94***	1.537	-14.42	-13.1	-72.16***
number crops	-35.23	5.582	-41.72**	-11.63	-179.1**	-2.326	14.67	-33.07	-163.9***
male	-49.52	47.69	-73.44	-80.44	-91.68	-64.42**	122.6	53.22	15.12
age	0.0677	-4.396***	0.207	-3.407	-0.0951	0.789	-1.765**	1.116***	1.29
business age	-4.509**	3.876	-2.963*	-8.702**	-18.64	-2.501	1.029	-9.316	-0.139
sec.educ.	98.82***	64.78	-225.2**	352.6*	-64.59	-41.03	-30.16	45.11	131
nr. dependents	-3.127	1.411	-16.16**	-1.333	-33.08**	8.401*	-4.502	3.811	-6.669*
irrigation	298.2**	244.3***	278.5	150.2	790.5**	144.2**	72.48	97.03	246.6***
cellphone	-60.18	30.25	17.07	-38.61	-651.8	61.31	-91.86	81.15	248.0*
agr-group	-35.3	-34.91	-89.49	22.84	-27.55	44.83	-44.84	26.09	64.14**
fin. records	10.03	38.49	80.08	-13.61	-77.73	-19.2	4.427	78.17	391.5***
bus. registr.	56.13		449.3	26.15	271.6	197.9	-2.269	-318.9	295.9*
extension services	103.7**	1.663	67.28**	56.86	385.2	-8.535	12.43	119.0*	276.4
sell individually	16.63	424.1*	550.5	105.3	303.3*	-9.261	-91.01	-196.8**	467.9***
Constant	479.0***	-260.9	41.9	536.6**	1,794	147.4	298.5	336.6*	200.9
Observations	3,341	278	334	524	466	432	630	499	178

(v) Extension services: There is a positive relation between farmers that receive some kind of extension services and turnover/acre for the sample as a whole, as well as in the rice and tobacco value chains and the Eastern and Western zones[12].

Recommendation:	*Extension services – provided they address the real needs of the farmers and that they build the capacity of farmers effectively – can have a highly significant positive impact. This is no secret; the problem is to establish which services are cost-effective and which are not. Farmers that received extension services tend to have higher turnover/acre in the rice and tobacco value chains. Thus, it would be interesting to analyse these two value chains in more detail and to compare the extension services that are given to these farmers with, for instance, the cashew and cotton farmers. Not only would this help us to explain why there is a positive correlation for the former value chains and a negative one for the latter; it may also generate some ideas for setting up extension services in other value chains.*

5.2 Use of formal saving products

In line with the objectives of the AgFiMS project, we investigated how various factors relate to the use of savings products through formal financial institutions, such as banks, MFIs & SACCOs.

[12] Surprisingly this is not the case for the cashew and cotton value chains. Once again, it is important to note that a statistically significant correlation does not necessarily imply a causal relationship. It can also be the other way around. In other words, in this case less 'productive' cashew and cotton farmers receive more extension services.

The regression analysis (see tables 5.3 and 5.4) shows that several factors correlate strongly with the use of savings products through formal financial institutions:

(i) Having a bank account: There is a strong positive relation between having a bank account and having formal savings. This applies to most value chains (except cotton, sunflower & livestock) and all zones.

Recommendation:	*Formal financial institutions can increase the deposits from private savings simply by promoting bank accounts across the country and by making it easier for people to open bank accounts, by simplifying procedures for that purpose. They could start by focusing on the value chains which have shown to have a high correlation for these variables.*

(ii) Total turnover: There is a strong positive relation between total turnover and having formal savings for the sample as a whole and for the coffee and maize value chains and the Northern, Southern and Western zones, in particular[13].

Recommendation:	*Formal financial institutions could promote savings to businesses with larger total turnover starting with the value chains and zones that are mentioned above.*

(iii) Total land size: There is a strong positive relation between the total land size and having formal savings in the sample as a whole, in the cashew, cotton and tobacco value chains and in the Central zone[14].

Recommendation:	*Formal financial institutions could promote savings to businesses with larger land size starting with the value chains and zones that are mentioned above.*

(iv) Secondary education: There is a strong positive relation between having some form of secondary education (or higher) and having formal savings for the sample as a whole; for cashew, coffee and maize farmers and for the Northern zone[15].

Recommendation:	*In general the higher the education level the more likely people are to save with formal institutions. Farmers in Tanzania are no exception to this rule. Training is business skills and, in particular, financial record keeping may also be an effective way to promote savings in most value chains and zones.*

[13] The exception is Zanzibar, were this relation is negative. This suggests that farmers with higher turnover actually save less on Zanzibar or that those that save more have less turnover. At the same time, more 'productive' farmers, which as we have seen earlier tend to be the ones with smaller plots, seem to save more.
[14] The exception is the southern zone, where the relation is negative.
[15] Exceptions are the coffee value chain and Zanzibar, where the relation is negative.

(v) Cell phone: There is a strong positive relation between having a cell phone and having formal savings for the sample as a whole; the maize value chain and the Northern, Southern and Southern Highland zones[16].

Recommendation:	*Financial institutions could use cell phones more effectively to communicate the benefits of saving to producers, in particular in the maize value chains and the aforementioned zones.*

(vi) Group membership: There is a positive relation between being a member of an agricultural group and having formal savings for the sample as a whole, the maize value chain, the Central zone, the Southern Highlands and Zanzibar. On the whole, producers that are members of farmers associations or other types of agri-groups seem to save more at formal institutions.

Recommendation:	*Promote the creation of new producer groups or membership in existing producer groups, in particular in the respective value chains and zones, as an effective strategy to generate more savings. Subsequently these groups could be linked to formal institutions for savings, e.g. SACCOs.*

(vii) Financial record keeping: There is a positive relation between keeping financial records and having formal savings in most value chains and zones, except rice and the Southern zone.

Recommendation:	*Promote financial record keeping, e.g. through financial literacy campaigns, in respective value chains and zones, with a focus on the benefits of saving through formal institutions[17].*

[16] The exception in this case is the tobacco value chain, where this relation is negative.

[17] Financial record keeping is more than just keeping track of sales revenue, which for most cash crop farmers is fairly simple, as they only have a few sales per year. It should at least include keeping records of expenses.

Table 5.3: Formal saving, per value chain

Formal Saving	FULL	beans	cashew	coffee
formal credit	0.525	-0.232	0.956***	3.021
bank account	5.576***	6.505***	6.852***	8.659***
insurance	0.251			-0.854
turnover/ acre	-0.00017	-0.0014	0.0052***	-0.00164
turnover total	8.25e-05***	0.000836	-9.86E-05	0.000733**
number staff	-0.0208	0.134	-0.150***	-0.068***
land size used	0.0104***	-0.0628	0.109***	-0.0385
title deed	-0.127	-134.1*	1.019**	0.925
land size*title	-0.00469	18.32**	-0.124***	-0.259
number crops	-0.174	-0.209	-0.254***	-1.027***
male	-0.0557	-0.442	0.876	0.194
age	0.00207	0.0797	0.00218	-0.124***
business age	-0.00164	-0.11***	0.0497*	0.0169
sec.education	0.597**	-1.204	1.310***	4.612***
# dependents	-0.0357	0.195	-0.180**	-0.139
irrigation	-0.102	1.637		1.181***
cell phone	1.079***			
group membr	0.712***	3.326	1.094***	0.722
fin. records	0.693***	2.366***	2.130***	3.159***
bus. registr.	0.355	0.166		4.537***
ext. services	0.198	-1.344	1.583***	-1.585*
sell individual	1.156***	0.816	3.186**	1.832**
Constant	-6.008***	-10.5***	-10.95**	0.256
Observations	3,341	140	268	217

cotton	maize	rice	sunflowr	tobacco	livestock
	0.481	-4.316***	86.01	0.497	-0.106
	5.875***	42.83***	178.1	5.883***	6.256***
	0.881				-2.729***
	-2.05E-05	-0.0019**	0.0263	0.000809	-0.00014*
0.000307	5.76e-05**	0.000112	0.00329	-7.54E-05	-7.94E-05
0.000129	-0.088**	-0.273	-4.81	0.0908	0.0514
0.057***	0.0125	0.265	1.59	0.0349**	-0.0143
0.0121	0.0961	1.195		0.4	0.957**
	0.0106	-0.198		-0.0233	0.0203**
	-0.0769	-1.22	-30.04	-0.152	0.035
0.147***	-0.174	-3.383		0.951	0.528
	-0.0280*	-0.0811	2.329	0.0841**	0.0462
0.0235*	0.0638**	-0.0194	-1.289	-0.0142	-0.0047
-0.032***	1.037***	3.675	94.89	-0.189	0.808
	0.0326	0.0527	-13.14	-0.0319	-0.0743**
-0.0114	-0.90***	0.585	-21.65	-0.179**	
0.471	1.514**			-2.391**	
	1.209***	-3.096	39.89	-1.063	-0.795
	0.736**	-28.08***	-31.21	1.264	-0.301
0.72	2.655***	4.952		0.541***	0.683
1.061	-0.0302	4.839	63.64	-0.152	1.294
	-0.334	-17.29***		-0.728	0.211
-5.013***	-4.89***	15.01***	-103.9	-6.19***	-6.387***
220	553	396	111	193	323

Table 5.4: Formal saving, per zone

Formal Saving	FULL	Central	Eastern	Lake
formal credit	0.0318*	0.0545	0.0218	0.1
bank account	0.839***	0.837***	0.850***	0.793***
insurance	0.0238		-0.14	-0.0651*
turnover	3.05e-06**	5.05E-06	4.15E-06	2.62E-06
turnover/acre	-5.31E-06	4.11e-05**	-2.03e-05***	2.08E-05
number staff	-0.000766	-0.000826	0.00135**	-0.00167
land size	0.00047***	0.0008**	0.000612	0.000661
title deed	-0.00817	-0.104	0.0994	0.00599
land size*title deed	-0.000198	0.00595	-0.00218	-0.00268
number crops	-0.00759	0.00537	0.00255	-0.00691
male	-0.00206	-0.029	-0.00166	-0.0136
age	8.63E-05	0.00278*	5.88E-05	8.31E-05
business age	6.78E-05	-0.000181	3.62E-05	0.00175
sec..education	0.0358*	0.0524	0.0179	-0.00012
nr.dependents	-0.00134	-0.0073**	-0.00916*	0.00223
irrigation	-0.00345	0.0324*	0.0829	0.0463**
cell phone	0.0151**	-0.00962	0.0241	-0.00689
member group	0.0318**	0.0502**	-0.00601	-0.0224
fin. records	0.0249**	0.00289	0.0105	0.0319**
bus. registration	0.0216		0.0316	0.0383
ext services	0.00673	0.0254*	-0.00553	-0.0269
sell individually	0.0592***	-0.146*	-0.0656*	-0.122
Constant	-0.0486*	0.0791	0.105	0.0999
Observations	3,341	278	334	524

Northern	Southern	South. H	Western	Zanzibar
-0.0292	0.119*	-0.00467	-0.00698	0.0103*
0.774***	0.797***	0.871***	0.876***	0.88***
-0.019	-0.0238	0.0969**		0.0026
4.16e-06***	2.03e-05***	1.65E-06	1.21e-05*	-5.99e-06*
-7.42e-06**	-3.45E-08	-1.55E-06	-0.000112	3.95e-05**
0.000969	-0.0069*	-0.0017*	-0.00393	0.0120**
0.000305	-0.0011*	0.000288	-5.74E-07	-0.0014
-0.0443	-0.0335	0.01	-0.000595	-0.0303
0.000695	-0.00157	-9.88E-05	-0.00111	0.00602
-0.0216**	-0.00325	-0.0232	0.00641	0.0160**
-0.0123	0.0346	0.0558	-0.0294	0.00883
-0.00006*	-0.00034	0.0013	0.0002**	-0.0015**
0.00163	0.00138	-0.00061	-0.000442	-0.0033**
0.0827**	0.0562	0.0127	0.0414	-0.0229**
-0.00334	0.00276	0.00112	-0.0011**	-0.005***
-0.047***	-0.025	-0.00446	-0.0186	0.0240**
0.0431***	0.0452*	0.0251*	0.00045	0.0212***
0.0706	0.0347	0.0730**	-0.00924	0.0306***
0.0629**	0.0546**	0.00664	0.00656	-0.073***
0.330**	-0.255*	-0.0111	-0.00869	0.0616***
0.0282**	0.0361	-0.00103	0.00299	0.000955
0.236	0.0687**	0.039	0.040***	-0.00619
-0.219	-0.16***	-0.0969	0.018	0.115**
466	432	630	499	178

5.3 Use of formal credit products

We also investigated how various factors relate to the use of credit products through formal financial institutions, such as banks, MFIs & SACCOs. The regression analysis (see tables 5.5 and 5.6) show that several factors correlate strongly with the use of credit products through formal financial institutions:

(i) Other formal financial products: There is a positive relation between having formal credit (access to finance) and holding other formal financial products for a number of value chains.

1. Formal savings: cashew, cotton and sunflower value chain and Central, Southern & Zanzibar
2. Bank account: beans, cashew and rice value chain and Northern, Western & Zanzibar
3. Insurance: coffee value chain and Northern zone

Recommendation:	*It makes sense for financial institutions to promote different financial products (cross-selling) in particular in the value chains and zones mentioned above.*

Table 5.5: Formal borrowing, per value chain

	FULL	beans	cashew	coffee	cotton	maize	rice	sunflowr	tobacco	livestock
form saving	0.572	0.244	0.556***	2.475	12.93***	0.408	-2.822***	1.289***	0.61	0.0927
bank accnt	0.45	3.076**	0.937*	-0.689	-11.02***	0.885	4.022***	0.712	0.857	1.185
insurance	0.960*			2.839***			0.587			-0.602*
turn/acre	1.56E-05	-0.00453*	0.0018***	0.00021	-0.0050**	-0.00043	-0.00053	0.0019***	-0.00073	9.15E-05
turnover	-4.57E-06	0.00041**	-0.00011	-0.00015	0.0005***	3.30E-05	6.83E-05	0.0003***	7.11E-05	-8.83E-05
# staff	0.00388	-0.211**	0.129***	0.00687	0.0926***	0.013	0.0262	-0.0336	-0.0871	-0.214***
land size	0.00224	-0.321***	0.00067	0.0956***	-0.087***	0.0118	-0.0323	-0.00622	0.0405**	0.00752
title deed	0.392	2.173		0.85		0.258	-0.101			-0.129
land*title	-0.0134	0.0608		-0.0609		-0.149**	0.0481**			-0.00384
# crops	0.0675*	0.336	0.179***	0.064	-0.131	0.175	0.618***	0.706***	0.00436	0.0405
male	-0.578***	-0.874	-1.066***	-0.147		-0.115	-0.479		-0.589	-0.297
age	-0.00021	-0.00078	-0.0027	-.0545***	-0.034***	-0.0187	-0.0197	0.0588***	0.00839**	0.0132
bus. age	0.00019	-0.0942**	0.0176	0.0447	0.0406	-0.0297*	-0.0179	0.0519*	-0.0206	0.00612
sec. educ.	0.362	1.403	1.078***	1.261		-0.325	0.447		-7.037**	0.675*
dependent	0.00488	0.255***	-0.089***	-0.0416	0.0179	0.0502	0.0208	0.102	-0.00461	0.0351
irrigation	0.363**	0.249	2.407***	0.533	0.725	0.0882	1.394***		0.314	
cell phone	0.694**	0.209	0.0848			1.083			0.890**	0.642
group	0.787***	-0.185	1.150**	-0.688	1.674***	1.329***	0.357	3.025***	0.377	1.085***
fin. record	0.286*	-1.188	-0.1	1.038	0.816	0.189	-0.0675	-0.0124	-1.339*	0.632**
bus. regist.	0.275	2.753**		-1.306	-0.669	1.642**	-2.307		0.102	0.566**
ext. serv.	0.992***	1.231	0.311	1.706***	0.418	0.879***	1.118***	1.472*	2.298***	1.083*
sell individ	0.904***	-11.63***	-0.280**	-1.104					2.469***	-0.125
Constant	-4.834***	9.802**	-2.922***	-2.417	-3.173***	-4.135***	-4.565***	-10.09***	-5.547***	-3.857***
Observat.	3,341	169	285	217	214	545	395	95	185	334

(ii) Business ownership by gender: There is a negative correlation between male business ownership and holding formal credit products for the cashew value chain and Northern, Southern Highlands and Zanzibar zones. It's not clear how significant this finding is in reality, as only a small portion of the producers in the survey sample were women (13%). Apparently a high percentage of those women have access to credit, but in view of the small size of this group it does not mean a lot.

(iii) Irrigation: There is a positive relation between having irrigation and having access to formal credit products for cashew and rice, and the Eastern, Southern Highlands and Western zones. This finding is in line with the previous finding on the positive relation between irrigation and turnover per acre. It supports the view that specific credit products for irrigation are relevant, particularly for the aforementioned value chains and zones.

Recommendation:	*Promote specific credit products for irrigation as this in turn has a high probability of leading to an increase in turnover per acre ("productivity").*

Table 5.6: Formal borrowing, per zone

Formal Borrowing	FULL	Central	Eastern	Lake	Northern	Southern	South. H	Western	Zanzibar
saving formal	0.572**	1.282**	0.589	1.959	-0.33	1.855**	0.124	0.193	0.263***
bank account	0.450*	-0.293	0.608	0.058	1.684***	-0.363	1.085	0.672*	0.698***
insurance	0.96		-2.843***		2.370**				0.923
turnover/acre	1.56E-05	-0.00185	0.00062***	-9.17E-05	-0.0001	-0.00093	0.0009**	-0.00242**	0.000272
turnover total	-4.57E-06	0.0003***	-0.0003***	-1.53E-05	3.73E-05	0.00013	-0.0002**	0.00023***	-7.81E-05
number staff	0.00388	0.0783**	0.0498**	0.0242	0.0125	0.107**	-0.00429	-0.0163	-0.0134
land size used	0.00224	-0.024***	0.00164	0.00761	-0.011***	-0.0529	0.037***	-0.00976	0.0183
title deed	0.392**		-0.91	-2.855***	1.103***	-4.504***	-0.577**	0.384	-0.439*
land size*title	-0.0134		0.109***	0.273***	-0.0455	0.0988***	-0.0224	0.0419	0.0653
number crops	0.0675	0.0449	0.0179	0.19	-0.116	0.283***	0.121	-0.0332	0.190**
male	-0.58***	-1.085	-0.3	0.273	-0.595**	-0.811	-0.926***	-0.0717	-0.106*
age	-0.00021	0.037***	-0.00457	-0.0159	-0.015	-0.00868	-0.032***	0.0039***	0.0073
business age	0.00019	0.0485**	0.0119	0.00181	0.0216	-0.0198	0.0465**	-0.0617**	0.009***
sec. educ.	0.362**	2.022***	-1.087***	0.345	-0.48	0.852	0.827***	-0.299	0.289
# dependents	0.00488	0.0584	0.0072	-0.077	0.084***	-0.00264	-0.00493	0.0152	-0.0254*
irrigation	0.363***	-0.171	0.807*	0.494	0.199	0.177	0.538***	1.048***	-0.0827
cell phone	0.694***	-0.242	0.241			1.462		0.783*	0.0568
group membr	0.787***	1.155	0.596	0.494	0.640**	0.621**	0.171	0.639	2.176***
fin. records	0.286**	1.006	-0.149	0.848*	0.141	0.509	0.391	-0.322	0.231***
bus. registr.	0.275		3.010***	-0.606	1.009	0.0849	-0.382	0.0623	0.559**
ext services	0.992***	0.297	0.527	0.952**	0.784***	0.748*	1.564***	2.058***	-0.0849
sell individual	0.904		-0.761		-0.510*	-0.796	0.411	1.091	-0.303**
Constant	-4.83***	-5.347***	-2.098**	-3.875***	-2.542***	-3.418**	-3.498***	-5.213***	-2.405***
Observations	3,341	273	334	474	442	430	602	499	178

(iv) Cell phones: There is a positive relation between having a cell phone and having access to formal credit. This is true for all value chains and zones (except the Central zone), but the correlation is only significant for the tobacco value chain and the Western zone.

Recommendation:	*Promote financial products to agribusinesses using cell phones, particularly in respective value chains and zones.*

(v) Group membership: There is a positive relation between being a member of an agricultural group and having access to formal credit for most value chains and zones. This is hardly surprising and it is actually a bit surprising that this is not the case for all value chains[18].

Recommendation:	*Build on existing group infrastructure for the promotion and delivery of formal credit products (e.g. through SACCOs) and promote new associative initiatives among producers in specific value chains where these are do not yet exist. This applies to all value chains, although it makes sense to focus primarily on those that are most significant (cashew, cotton, maize sunflower and livestock).*

(vi) Financial record keeping: There is a positive correlation between keeping financial records and having access to formal credit for the livestock value chain and the Lake Zone and Zanzibar. It is actually a bit surprising that this is not the case for more, if not all value chains and zones, as it is generally assumed that lack of financial records is an obstacle when accessing credit. In the case of tobacco there is even a statistically significant negative correlation. This may have various explanations, including the argument

[18] For beans and coffee there is even a negative correlation, though not statistically significant.

that financial record keeping can be done in many ways (the survey does not look at the quality of record keeping), to sample composition issues[19]. Furthermore, financial literacy campaigns may have hitherto primarily targeted those market segments that were using less financial products at the outset. Thus, even if such campaigns have actually raised financial product use this would not show up in the data, as they come from a lower starting level. Trend analysis with multiple rounds of data collection could help get a clearer picture of the real impact of record keeping on access to credit.

Recommendation:	*Promote financial record keeping at grassroots level (e.g. through financial literacy campaigns) in general and in particular in the values chains and zones mentioned above.*

(vii) Extension services: There is a positive relation between receiving extension services and having access to formal credit for coffee, maize, rice, sunflower, tobacco and livestock farmers and in the Lake, Northern, Southern, Southern highlands & Western zones. This is exactly what one would expect and the relation is even stronger with access to credit than with savings.

Recommendation:	*Promote extension services in all value chains and zones, in particular the ones mentioned above. A pilot project to link extension services with group formation (and financial record keeping) aimed at maize farmers in the Southern, the Northern or the Lake zone would be interesting.*

5.4 Risk management

As agri-businesses face many risks, most notably weather fluctuations, we looked at how various risk management strategies (incl. insurance) relate to the turnover/acre of producers. Furthermore, we investigated how these relationships differ between the value chains and agro-ecological zones.

Table 5.7: Turnover/acre & insurance, per value chain

TURNOVER/ACRE	FULL	beans	cashew	coffee	cotton	maize	rice	sunflowr	tobacco	livestock
insurance	-288.5***	-1,983***	-30.95***	-149.5**		-170.4	-127	-22.02	-99.22	-1,032*
forward contract	24.02	1814***	0.692	-94.3	360.8	-167.7**	240	-417.8	22.01	446.4
mult customers	127.7**	113.7	25.58	22.36	17.14	156.5***	-89.43	-32.3	183.8	174.1
multiple incomes	52.12*	-34.29	90.07***	-16.47	204.4	42.91	66.37	90.23	377.6	-78.92
mixed farming	123.8*	56.38	-1.224	58.99	-57.53	211.4***	-81.52	-114.7	-75.38	-172.6
outside selling	585.8		-18.72	-114.2	5.401	-271.3	416	-140.5	630.7	-1,496
none	81.46*	-67.59	-0.831	-150.1	-29.72	156.2**	-192.6	-174.1	232.1*	401.7
using savings	-161.8**			-139.7	2.997		-191.1		-190.4*	-58.4
Constant	413.6	200.7	141	-20.46	103.3	959.5	627.9**	343**	199.9	91.02
Observations	3,341	170	293	239	259	553	421	127	193	334

Table 5.8: Turnover/acre & insurance, per zone

TURNOVER/ACRE	FULL	Central	Eastern	Lake	Northern	Southern	South. H	Western	Zanzibar
insurance	-288.5***	-74.81	-1,689	-194.6*	-539.6***	34.08	-589.9***	-96.12	423.2
forward contract	24.02	-48.51	-777.5	-173.5	-78.86	8.363	19.17	292.5	274.7*
multiple customers	127.7**	46.69	-108.4	-18.18	188.5	127.7*	148.4	51.31	290.4*
multiple incomes	52.12**	78.46***	80.64	55.22	-65.69	80.03*	65.59**	184.5**	-37.96
mixed farming	123.8*	166.7*	-37.66	-69.24	197.1	58.97	119.0	-10.01	-450.6
outside selling	585.8	102.6**	-274.4	-136.4	927.2**	79.68	3,246**	40.49	-390.9
none	81.46	97.06	-51.78	-90.61	-26.73	135.1	115.5	139.8	901.7
using savings	-161.8***			-163.6				-95.08***	-154.3
Constant	413.6***	63.65	684.2***	721.1**	1,972*	43.48	88.47	123.9*	869.8*
Observations	3,341	278	334	524	466	432	630	499	178

[19] In the case of tobacco, it may be due to the fact that most farmer keep some kind of financial records, but a much smaller groups has access to finance, so.

Tables 5.7 and 5.8 shows the following relation between risk management strategies and turnover/acre:

(i) Insurance: There is a negative relation between insurance and turnover/acre in most value chains and zones. Although it is only statistically significant in half the cases. This is not what you would expect as more 'productivity' tends to be associated with better risk management. A possible explanation is that insurance initiatives have mainly targeted farmers with high turnover. As we saw above, producers with higher turnover tend to have lower average turnover/acre, thus it follows that the more 'productive' farmers (with higher turnover/acre) tend to have less insurance. Thus, the findings do *not* suggest that insurance *leads to* lower turnover/acre, but only confirms that insurance initiatives have mainly targeted larger farmers.

Recommendation:	*Insurance companies should develop insurance products, particularly for weather risks, which are tailored for relatively smaller agri-businesses.*

(ii) Informal risk management strategies: There is a positive relation between informal risk management strategies (such as having multiple customers, multiple sources of income, mixed farming) and turnover/acre. This applies to the sample as a whole, in particular to maize and the Central zone.

5.5 Use of irrigation systems

As the lack of water for irrigation is found to be a key constraint to realizing higher turnover/acre, we looked at how various factors relate to the use of irrigation systems, with the aim to identify if and how interventions in the financial domain may contribute to enhancing access to this technology.

Table 5.9: Irrigation systems, per value chain

Irrigation	FULL	beans	cashew	coffee	cotton	maize	rice	sunflower	tobacco
turnover total	-8.79E-06	-0.00087**	0.0622	0.000234**	-0.000642	0.000272***	6.91E-05	-0.0013***	-0.000171
turnover/acre	0.00043***	0.00582**	-0.521	-0.000956	0.0101	-0.00084***	0.000961	0.00968*	0.000774
saving formal	-0.0667	0.638		0.516	9.616**	-0.672***	0.631**	3.962***	-0.32
formal credit	0.329***	-0.636	1.861	0.474	0.54	-0.0193	1.169**		-0.141
bank account	0.430**	-1.329		0.722	-8.101	0.579***	-0.0786	-0.111	-0.0939
Insurance	-0.514					-6.068***			
number of staff	0.0227***	0.00526	-11.85	-9.13E-06	-0.0405	0.0235	-0.0117	0.659***	0.0237
land size in use	-0.00304	0.00783	0.0297	0.0642	-0.00229	-0.0340*	-0.0193	-0.219***	0.0742
title deed	0.346*	-2.065		3.574**	106.3***	0.986	0.0133		3.198
land size*title	-0.00512	0.363		-0.554***	-9.769***	-0.0593	-0.000953		-0.635
number crops	-0.0141	0.811***	-21.66	-0.00291	-0.00354	0.178	0.0231	0.170*	-0.25
male	0.178	-1.012	-66.43	1.959***	0.135	0.0616	-0.384		-1.926***
age	-0.00592	0.0435	-1.579	-0.00483	-0.00573	-0.00132	0.00543	0.0450**	-0.018***
business age	0.00271	-0.0527	0.746	-0.0222	0.0084	-0.0177	0.00911	0.0998	0.00259
sec.educ.	0.273***	1.558		-1.715*		0.453*	0.819*	3.120*	-0.951
nr. dependents	0.00178	0.200*	-6.658	-0.138**	-0.0561	0.0546	0.0364	-0.0424	0.0198
cellphone	0.466	0.943				-0.652	0.743	-1.119	
agr-group	0.0762	-0.552		-0.425	-0.176	0.539**	1.053*	0.692	-0.621
fin. records	0.326***	1.521***	-18.54	0.232	0.356	0.194	0.467*	-1.963***	-0.0934
buz exp records	0.107	1.006***	66.93	1.094*	-1.156**	-0.103	0.208	2.911***	-0.223
bus. registr.	0.624*			1.577*	0.633	-0.378	-0.29		0.781***
Ext. services	0.393***	0.164	4.401	-0.12	1.203***	-0.029	0.540*	0.376	-0.533
sell individually	-0.0322	-5.534***		0.152	-0.194***		1.782		-0.451***
Constant	-2.548***	-2.873	117.1	-3.514***	-2.650***	-1.767*	-4.991***	-6.268***	3.272***
Observations	3,341	165	165	215	242	548	418	108	189

We find several factors to be significantly related to the use of irrigation:

(i) Turnover/acre: There is a positive relation between turnover/acre and having an irrigation scheme in the beans & sunflower value chain and the Central, Eastern & Zanzibar zones.

(ii) Formal borrowing and bank accounts: There is a positive relation between having access to formal financial products and having an irrigation scheme in a number of value chains and zones, as follows:

- For formal credit: rice value chain and eastern, southern & western zone
- For bank accounts: maize value chain and central & northern zone

Recommendation:	*As mentioned above, the development of specific financial products aimed at enabling farmers to acquire irrigation, can contribute to deepening the access to irrigation schemes and subsequently boost turnover/acre, in particular in the rice and maize value chains.*

Table 5.10: Irrigation systems, per value chain

Irrigation	FULL	Central	Eastern	Lake	Northern	Southern	South. H	Western	Zanzibar
turnover total	-8.87E-06	-0.00054*	4.81E-05	1.97E-05	-2.98E-05	-0.000132	0.00016***	-7.35E-05	-0.00015**
turnover/acre	0.00043***	0.0059***	0.000315*	0.000304	0.000474	0.00189	-0.00072***	0.000865	0.00086***
Formal credit	0.330***	-0.0976	0.906***	0.476	0.222	0.259	0.514***	1.170***	-0.156
saving formal	-0.0656	0.386	1.927	1.304	-0.633***	-0.459	-0.0625	-0.310*	0.828***
bank account	0.434**	0.625***	-0.866	-0.452	0.640***	0.574	0.22	0.402	-0.449
insurance	-0.526				-0.0912				-1.541
number of staff	0.0229***	0.03	-0.00584	-0.0149	0.110***	0.109**	-0.00527	-0.0626	0.00222
land size in use	-0.00311	-0.00314	-0.0394	0.00145	-0.0499**	0.0312	0.00425	0.0018	0.419***
title deed	0.339*	5.634***	1.095***	1.800**	0.424	0.833	0.0741	-0.0489	1.484***
land size*title	-0.00482	-0.149*	-0.0519	-0.0972	0.00248	-0.031	-0.00673	0.0897	-0.322***
number crops	-0.0151	-0.139	0.175	-0.238**	-0.315**	0.05	0.0861	-0.0393	0.747***
male	0.182	1.428***	-0.00253	0.171	0.448	0.397	-0.600***	-0.144	0.23
age	-0.00591	0.0180***	-0.00162	0.00301	-0.00181	-0.045***	-0.00703**	-0.0198	0.0179**
business age	0.00278	0.0297	-0.0672**	-0.0309	0.0072	0.00454	0.0172	-0.0104	-0.0288***
sec.educ.	0.272***	0.188	1.275***	-0.0103	0.305	-0.461	0.669***	0.0556	-0.428
nr. dependents	0.00191	-0.123***	0.0344	0.0291	0.0181	0.0633	-0.0773***	0.0343***	0.146***
cellphone	0.465	0.647	-0.864		0.994	-0.385	-1.311**	1.854	0.452
agr-group	0.0749	1.150***	1.270***	-0.672	0.136	0.496	0.384	0.219	0.121
fin. records	0.335***	0.207	-0.227	0.805***	0.498***	-0.0935	-0.133	0.860**	1.755***
bus. registr.	0.629*			0.131	-1.351	0.0934	0.943**	0.795***	0.869***
ext. services	0.395***	0.396	1.166***	0.416*	0.242*	-0.145	0.331	0.284	-0.417
sell individually	-0.0383				-0.0546	0.573	0.0579	0.405	0.0137
Constant	-2.531***	-4.676***	-2.780**	-1.753***	-2.389**	-2.153**	0.249	-3.323***	-8.295***
Observations	3,341	277	322	474	466	430	628	499	178

(iii) Financial records: There is a positive relation between keeping some form of financial records and having an irrigation scheme in the beans and rice value chain and the Lake, Northern and Western zones, as well as Zanzibar.

(iv) Extension services: There is a positive relation between receiving some form of extension services and having an irrigation scheme in the cotton value chain and the Northern and Eastern zones.

5.6 Access to information on obtaining credit

As a lack of information on how or where to obtain formal credit was found to be a key constraint to the actual use of formal credit, we looked at how various factors relate to this constraint.

In tables 5.11 and 5.12 we see that various factors are inversely related to "the credit information gap" (marked in red). *In other words: for those farmers, if they did not receive credit from a formal financial institution it is less likely that this was due to not knowing how/where to obtain such a credit.*

TABLE 5.11: CREDIT INFORMATION GAP, PER VALUE CHAIN

CREDIT INFO GAP	FULL	beans	cashew	Coffee	cotton	maize	rice	sunflower	tobacco	livestock
saving formal	-0.106	-0.596	-0.0986	-1.571**	11.68***	-0.238	1.406	0.375**	1.197***	-0.828***
turnover/acre	4.36e-05*	7.48E-05	0.00319***	0.00251	-0.000452	1.09E-05	0.00113***	-0.00870*	0.00126*	2.16E-05
turnover	-2.73e-05*	-4.33E-05	-0.00033***	-0.000553	4.16E-05	-0.00011	-0.000114	0.000627	-0.00024*	1.92E-05
bank account	-0.42***	-0.469	-1.127*	0.447	-12.24***	0.00541	-1.913	-1.967***	-1.060***	0.1
insurance	0.654			1.676*						
number staff	-0.00417	-0.0726	-0.1	-0.0535**	-0.133***	0.00574	0.0318	-0.0673	0.00191	0.0451
land size used	-0.010**	0.00685	0.0218***	0.0619	-0.024***	-0.00748	0.0157	-0.0343***	-0.0334	0.0299*
title deed	-0.21		-0.946*	-0.48		0.31	0.27			0.552
land size*title	0.00917		0.0159**	0.178		-0.0334	-0.0835***			-0.18
number crops	0.00834	0.0519	0.0628	-0.205	0.00233	0.292***	-0.147	-0.0377	0.187	-0.129
Male	-0.144	-0.491*	-0.459***	-0.745***	0.509***	0.0668	-0.294	0.478*		0.43
age of owner	0.000476	0.0159	0.0128	0.0121***	0.0330**	-0.0102	0.0250**	-0.0182	-0.0289	-0.0106
business age	0.015	-0.00625	0.00660***	0.0573	0.0275	-0.0253	-0.0025	0.0353*	0.0720***	0.0445**
sec.educ.	-0.349*	1.157	-0.384	0.0965	0.366	-0.383**	-0.728	-0.446	-0.259	-0.571
# dependents	0.0086	0.0444	0.0477	-0.0219	-0.0819	0.0631**	0.00625	-0.0175	0.0866	0.0516
irrigation	-0.220*	0.0856		-0.78	-0.313	-0.145	-1.224**	-0.759*	0.0547	
cell phone	-0.33***	0.0127	-0.168	-0.465***	0.17	-0.477	1.096	-0.0466	-1.764***	
group member	-0.59***	0.255	-0.0383	-1.131**	0.0285	-0.437*	-0.871***		-1.218	-2.01***
fin. records	-0.16	-0.889	0.0986	0.233	-0.681***	-0.288	0.388**	0.944***	0.471	-0.524
bus. registr.	-0.0606			-0.999		0.309			-0.00578	0.177
Constant	-0.87***	-1.31***	-2.231*	-0.508	-2.197***	-0.884	-3.265***	-0.496	-0.565	-2.27***
Observations	3,341	159	289	239	250	550	411	112	174	315

(i) Having a bank account: Businesses with bank accounts are less likely not to receive credit due to not knowing how/where to obtain a formal credit This is statistically significant for the sample as a whole, specific value chains (cashew, cotton, sunflower, tobacco) and a few zones (Lake, Southern, Zanzibar). One would expect those with bank accounts to know where to get a loan, thus the fact that many farmers mentioned this reason is probably linked to the fact that few of them have bank accounts.

(ii) Having a secondary education: Farmers with at least some secondary education are more likely to know how/where to obtain a formal credit. This goes for the sample as a whole as well as for specific value chains (maize) and zones (Southern Highlands).

Recommendation:	*Banks could be more pro-active towards potential clients in rural areas – in particular farmers - who tend to have lower levels of education. As mentioned above, having a bank account is often the first step for a client to acquire other financial products.*

(iii) Having a cell phone: Businesses with a cell phone are less likely to not know how/where to obtain a formal credit. This applies to the sample as a whole and to specific value chains (coffee, tobacco) and zones (Lake, Northern, Southern Highlands).

Recommendation:	*Banks and other financial institutions can make more use of cell phones to promote financial products, while at the same time not neglecting those farmers that do not have cell phones. It may be an option to promote bank accounts and cell phones simultaneously, in collaboration with a mobile phone company, perhaps even linking the initiative to mobile banking options.*

Table 5.12: Credit information gap, per zone

CREDIT INFO GAP	FULL	Central	Eastern	Lake	Northern	Southern	South. H	Western	Zanzibar
saving formal	-0.106	-0.326	-0.656	0.0531	0.422	-0.0641	-0.258	0.289	-0.649**
turnover/acre	4.36e-05*	-5.87E-05	0.000108*	6.59E-05	-6.59E-05	-0.0002***	-3.60E-05	4.33E-06	0.00016***
turnover	-2.73e-05*	-0.125**	-0.0595**	-0.0431	0.0658***	-0.133***	-0.0137	0.0353	0.115
bank account	-0.42***	-0.568	-0.227	-1.837***	-0.408	-1.015**	-0.0865	-0.245	-0.903***
insurance	0.654				0.469		2.381***		
no. of staff	-0.00417	0.000698	-0.000106	-0.00138*	6.83E-05	0.0028***	0.00014	-0.0005	-0.00091**
land size used	-0.0102**	-0.00896*	0.0184	-0.00963	0.000216	0.0259**	-0.0369**	-0.0466	-0.252
title deed	-0.21		0.987**	0.635	-0.354	0.970**	-0.394	-48***	-0.193
land size*title	0.00917		-0.127***	-0.167	-0.0226	-0.00588	0.0367*	2.957***	0.0775
number crops	0.00834	0.0435	-0.141	-0.154	0.0948	-0.0402	0.0766	-0.095**	0.189
male	-0.144	0.334*	-0.368**	-0.494*	-0.168	-0.14	0.407	0.0144	-1.595
age	0.000476	-0.037***	0.0145	0.0175***	-0.023***	0.0185***	0.0180**	-0.00265	0.0215
business age	0.015	0.0582***	0.00775	0.0685***	-0.0643**	0.000755	-0.000357	0.00587	0.0284
sec.educ.	-0.349*	-0.973	-0.486	0.653***	-0.463	-0.0706	-1.02***		0.403***
# dependents	0.0086	0.0364	-0.078***	-0.00972	0.0979***	0.0621*	0.0257	-0.0297	-0.117
irrigation	-0.220*	-0.252***	0.507	-0.129	0.23	-2.241*	-0.079	-0.706*	-0.281
cell phone	-0.33***	0.639***	-0.413	-0.218*	-1.067***	0.0682	-0.221*	0.635	-1.388
group member	-0.59***		0.0844	-0.308	0.0508	-0.535	-0.72***	-0.375	-3.35***
fin. records	-0.16	-0.608	0.288***	-0.184	-0.502***	0.297	0.543***	-0.139	-0.585
bus. registr.	-0.0606		2.314	-0.941	0.393		0.351	-0.606***	1.304***
ext. services		-0.135	0.0324	0.134	-0.591*	-0.289**	-0.59***	-0.420*	0.085
sell directly					0.116	-0.226	-0.0569	-0.645	-4.809***
Constant	-0.87***	-0.404	-0.898***	-1.248***	0.95	-2.715***	-2.169**	-0.37	5.844***
Observations	3,341	244	324	519	466	427	630	468	173

(iv) Being member of an agricultural group: Businesses that are member of an agricultural group are less likely to not know how/where to obtain a formal credit; in the overall sample as well as in specific value chains (rice, livestock) and zones (Southern Highlands, Zanzibar).

Recommendation:	*Promote group formation among farmers and build on their capacity to function as a vehicle to accessing formal credit, e.g. SACCO's but also as a delivery channel of information campaigns.*

(v) Age of farmers/age of businesses: Older farmers (older than 40) in the coffee, cotton and rice value chains and older businesses (more than 10 years old) in the cashew, sunflower, tobacco and livestock value chains are more likely not to know how/where obtain a formal credit. This is also the case for farmers and businesses in the Lake, Southern and Southern Highlands zones.

Recommendation:	*Financial institutions should target older farmers, for example cotton farmers in the Lake zone or coffee farmers in the Southern Highlands, with information campaigns suiting their profile, e.g. radio programs that are known to be popular among older listeners.*

5.7 Summary of findings

	Key finding	Recommendation	Value Chain	Zone
1	Mostly positive relation between use of formal savings and **turnover/acre**	Promote formal savings	Beans, Cashew, Coffee, Maize, Cotton(-), Rice(-)	Central, Lake, Southern Southern Highlands, Zanzibar, Eastern (-)
2	Positive relation financial record keeping and **turnover/acre**	Promote financial record keeping	Cashew, Sunflower, Tobacco	Zanzibar
3	Positive relation business registration &**turnover/acre**	Promote business registration	Cotton, Maize, Livestock	Zanzibar
4	Ambiguous relation extension services &**turnover/acre** (positive relation overall)	Analyse underlying reasons and promote cost-effective extension services	Rice, Tobacco, Cashew (-), Cotton (-)	Eastern, Western
5	Positive relation bank accounts and use of **saving products**	Promote use of bank accounts	Beans, Cashew, Coffee, Maize, Rice, Tobacco	ALL
6	Positive relation financial record keeping and use of formal **saving products**	Promote financial record keeping (through financial literacy campaign)	Beans, Cashew, Coffee, Maize, Tobacco, Rice (-)	Lake, Northern, Southern, Zanzibar (-)
7	Positive relation bank accounts and use of formal **credit**	Promote use of bank accounts	Beans, Cashew, Rice, Cotton (-)	Northern, Western, Zanzibar
8	Smaller and more productive producers underserved by formal **credit products**	Develop credit products and policies to serve this market segment	Beans, Cotton	Eastern, Southern
9	Positive relation extension services and use of formal **credit product**	Promote extension services	Coffee, Maize, Rice, Sunflower, Tobacco, Livestock	Lake, Northern, Southern, Southern Highlands, Western
10	Negative relation between **insurance** and turnover/acre	Promote insurance among smaller agri-businesses	Beans, cashew, coffee, livestock	Lake, Northern
11	Mostly positive relation formal borrowing &**irrigation**	Promote formal credit aimed at irrigation	Rice, other crops (& also full sample)	Eastern, Southern Highlands, Western
12	Older farmers and older businesses tend to lack information on where to obtain **formal credit**	Promote information campaigns targeted at older farmers and older businesses	Cashew, Sunflower, Tobacco, Livestock	Lake, Southern, Southern Highlands, Central (-), Northern (-)

6 Conclusions and Future Recommendations

The richness of the AgFiMS dataset makes it possible to carry out a wide range of regression analyses to investigate how the different variables interact. Unfortunately, as the AgFiMS survey has so far only been carried out once we do not dispose of time series and thus it is not possible to detect trends. This makes it difficult to determine causality of correlations that are statistically significant. In some cases, this can be construed from logical reasoning and/or other sources of information, but in general we have only referred to (positively or negatively) correlated variables in this report.

Nevertheless, the findings do allow us to extract a number of tentative recommendations for widening and deepening the access to financial services in the Tanzanian agricultural sector. In accordance with the Terms of Reference of the assignment, we have conducted our analyses at the level of value chains and of agro-ecological zones in order to allow for more targeted interventions based on the findings of the analyses. It should be noted that in most cases the sample case for specific value chains in specific zones was too small, so that we did not look specifically at this combination. With such small samples, correlations are far less likely to be statistically significant, thus they will automatically be filtered out of the analysis.

In this final chapter of the report we present the key conclusions of our analysis and provide a number of recommendations for how to translate these findings to future interventions by public, private & development sector stakeholders and to conducting further research.

6.1 Conclusions

1) The first key finding form our analysis is that there is a **strong and statistically significant correlation between formal savings & turnover/acre in nearly all zones and most value chains in Tanzania.** This finding is in line with a growing body of literature showing that not just credit but also savings products can lead to significant increases in the productivity and income levels of low income groups in Sub-Saharan Africa[20]. As the vast majority of agri-business in Tanzania still do not have access to credit through formal sources, a viable alternative to accumulating the required resources for productivity enhancing investments, such as irrigation schemes, is to save money with formal institutions. Whereas informal mechanisms such as saving at home and/or in savings groups may also be a viable strategy for this purpose, formal institutions offer several advantages – such as increased security and typically higher costs of withdrawing money from saving accounts which facilitates building up of larger amounts of savings. What is more, having a savings account with a formal institution may be a first step towards getting a loan from that same institution.

   *Based on this finding we recommend to **financial institutions** in Tanzania to focus more on developing and promoting attractive saving products for the agricultural sector. For example, a savings product specifically for irrigation schemes whereby a business can gradually save the amount required to (access additional finance to) purchase an irrigation scheme.As a next step, financial institutions may consider **combining savings products with other financial products**, including different types of loans, leasing and/or a warehouse receipts scheme.*

2) The second key finding is that **producers with lower total turnover, which tend to have higher turnover/acre, are underserved by formal financial institutions.** Historically financial institutions have focused more on the top-end of the market. However, our analysis shows that the mid-range of the market, i.e. the producers that meet the AgFiMS inclusion criteria (more than 5 acres land and/or turnover above USD 600 per annum) but do not fall in the highest turnover brackets typically achieve a substantially higher turnover/acre than agri-businesses with larger plots of land and correspondingly higher levels of absolute turnover.

   *Since these smaller businesses can boost their productivity further through the use of credit and savings products we recommend to **financial institutions** in Tanzaniato focus more on the market segment of smaller and more productive agri-businesses, in particular for those specific value chains and zones where*

[20] Stuart, R. et al (2010). What is the impact of microfinance on poor people?http://eprints.ioe.ac.uk/6394/1/Stewart2010What(Report).pdf

we demonstrated a significant positive correlation between turnover/acre and the use of formal saving and credit products.

3) The third key finding is that, in a number of value chains and zones, **record keeping, group membership, extensions services and business registration are positively correlated with access to formal financial services.** In particular, these factors are:

- whether the business is registered,
- whether a business keeps financial records,
- whether the business receives extension services,
- whether a business is member of an agricultural group.

The first three factors are also **positively correlated to turnover/acre** for most value chains; there is a negative correlation for 2 value chains with regards to extension services and for 3 value chains with regards to group membership. The negative correlation for the latter two factors should be further investigated for the respective value chains (cashew, cotton, maize and sunflower).

***S**ince these factors are not directly in the sphere of influence of financial institutions, it is up to both **the public sector and the development community** to contribute to and facilitate the up-scaling of these factors in the respective zones and value chains where they are strongly correlated with access to finance. For example, group membership was shown to be strongly correlated with access to credit for cashew farmers. There is also a positive correlation with use of formal saving and turnover per acre (not significant). Hence we recommend promoting group membership in this value chain. This is slightly more complicated for other crops (e.g. sunflower) where the findings are mixed.*

4) The fourth key finding is that **there is a negative correlation between the use of insurance and turnover per acre, in most value chains & zones.** Caution is warranted here, as this finding could be wrongly interpreted as suggesting that insurance leads to lower productivity! Rather, we suggest that formal insurance, which is still only rarely used by agribusinesses in Tanzania has hitherto been mainly used by larger businesses which typically have lower turnover/acre.

*We also saw that weather risks are by far the greatest danger facing agricultural producers in Tanzania, both in terms of their perception as well in terms of impact. According to our information there is at present no active insurance scheme that covers this kind of risk, such as index insurance, which is available to all farmers. Thus, we recommend the **insurance sector** in Tanzania to develop suitable insurance products for the agricultural sector, with a focus on weather insurance.*

5) The fifth key finding is that **older businesses and older owners lack information to obtain credit.** We find that in a number of value chains and zones it is particularly the older businesses and older business owners (farmers) that lack information on where and how to obtain credit, or they assume that they won't be eligible to obtain credit. Interestingly, we also found a positive correlation between use of cell phones and formal saving, which is compatible with the previous finding as the use of mobile phones is more generalized among young people.

*Based on this finding, we recommend to **financial institutions, the public sector and development organizations** to work together on initiatives to address these information constraints with a focus on this market segment, for example by implementing an information campaign on the radio (during a show which is known to attract older audiences) on how and where to obtain credit products.*

*For a younger public it would make sense for **financial institutions** to promote the use of formal savings (and other financial) products through cell phones, possibly in combination with options for mobile banking in collaboration with mobile phone companies.*

For further conclusions and recommendations we refer to the table at the end of the previous chapter, in which we have presented an overview of the key findings. The twelve tables with the details of the regression analysis provide a lot more interesting outcomes, which need to be interpreted with utmost caution. Many findings are in line with what one would expect, but some results are unexpected and need to be interpreted with caution. This applies, for instance, to the findings on the (effects of the) use of insurance. Since only a very small part of the sample was actually using insurance products – and not necessarily business-related insurance – it was difficult to derive statistically significant findings pertaining to this topic.

We already mentioned the negative correlation between insurance and turnover/acre. Another example is the negative correlation between extension services and turnover/acre for cashew & coffee farmers. One would instinctively expect a positive correlation, as is the case for the sample as a whole and for rice and tobacco farmers in particular. This kind of outcome is difficult to explain simply on the basis of the quantitative data, which is only a snapshot of the situation at that moment in time.

Additional research is called for to establish causality and be able to explain why the relation is inverse. This would include data collected at different moments (time series) to be able to establish trends, as well as qualitative data. Perhaps the extension services provided were of low quality so that their effect was actually counterproductive. Perhaps the extension services targeted specifically the less productive cashew and coffee farmers. It is impossible to determine based only on the AgFiMS data.

Further in-depth research into some of the key findings will undoubtedly lead to interesting results, which can verify (or prove false) some of our conclusions as well as suggest new interpretations and recommendations. For instance, if a causal relationship can be established between access to extension services and "productivity" (turnover/acre) for rice and tobacco farmers, it would be worth investigating further to identify the success factors. These factors could subsequently be replicated in other value chains (or agro-ecological zones) so that other farmers may benefit from the positive experience of their colleagues.

Thus, perhaps the main result of our analysis is the identification of a large number of hypotheses which call for further – quantitative and qualitative - research to determine their validity and draw implications for new policies and specific interventions from the different stakeholders.

6.2 Future Recommendations

1) **Additional rounds of data collection**.
   In order to get a better understanding of causal relations between variables, e.g. the relation between insurance and turnover/acre, we recommend to conduct additional rounds of data collection. Adding the time dimension to the analysis will allow for better identification of causality. In the case of extension services, for example, if agri-business that have received extension services during the period 2010-2013 have a greater increase in productivity than businesses that have not received extension services this would be a better indication of the effects of extension services on productivity than the mere correlations that we identified with our regression analysis.

2) **Collect more quantitative data on financial services**
   The AgFiMS data did not include questions on key financial indicators, such as (i) amounts borrowed/saved, (ii) product terms and (iii) repayment rates. Inclusion of such questions in future surveys is recommended as this would allow a better understanding not only of *whether* such products are used but also *how* they are used. Valuable insights could be derived, such as the extent to which a certain market segments (e.g. coffee farmers in Northern region) represent a viable business case – e.g. when repayment rates would be strongly negatively correlated with the grace period banks could try loans with a longer grace period to increase repayment rates.

3) **Collect more quantitative data on other indicators**
   The AgFiMS data did not include questions on other relevant indicators, such as:
   - Sales prices that farmers received for their produce,
   - Yields per acre,
   - Costs of production, and
   - Types and quantities of inputs used.

Of course, this kind of data is more difficult to obtain, but it is important and can serve to check the reliability of other indicators. For instance, if someone answers that he/she records business expenses, but cannot say what his/her costs of production are, this would lead us to doubt the first answer.

4) **Collect more quantitative data on external indicators from other sources**
The AgFiMS data could be complemented with detailed agronomic, economic and meteorological data which could serve to verify some of the findings. For instance, if many farmers in the Lake zone mention weather as their main risk, this could be checked with meteorological data.

5) **Reconsider the size and composition of the sample**
As was discussed during the final presentation, despite the efforts that were made to construct a sample that was representative of the main value chains and agro-ecological zones, there are still a few aspects that could be improved. For instance, the distribution of coffee farmers in the sample does not seem to reflect the distribution at a national level.
Apparently, the inclusion of farmers with at least 5 acres of land in the sample, even if their annual turnover was less than USD 600, was based on the idea that those farmers could attract finance to make their land productive, even they did not make good use of their land at the moment. However, this led to about 30% of the farmers in sample having less than USD 600 annual turnover, so that the total sample composition was much more biased towards “small farmers” than was intended.

6) **Workshops on use of data.**
The AgFiMS dataset is very rich. We have still only used part of this dataset since the scope of the assignment did not allow for a more exhaustive use of all data. For this reason, we think it would be very useful for financial institutions and governments alike to take a more active role not only in the implementation of policy recommendations, but also in the actual analysis of the raw data.

In order to achieve this we suggest it would be useful to organize workshops with different stakeholders where an external organization - such as Triodos Facet – could facilitate workshops on how to work with and interpret the AgFiMS data.

For more information about this analysis-conduct

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