FINAL REPORT

BASELINE FARM SURVEY IN SUPPORT OF THE DESIGN OF LOAN GY-L1060 SUPPORT OF SUSTAINABLE AGRICULTURAL DEVELOPMENT PROGRAM

Prepared for:

The Inter-American Development Bank

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Introduction

This report describes the process employed in the Agricultural House and Community Leaders survey and provides summary descriptions of the data collected. Also included in this report are details about quality assurance, inclusive of both the strategies implemented and the issues encountered during the data collection.

Background

The Government of Guyana (GoG) requested IDB funding for a loan operation for the agricultural sector. The "Sustainable Agriculture Development Program" (GY-L1060) will focus its activities in Region 5, Region 9 and Region 10. Its objective is to increase the productivity of the agricultural sector while maintaining sustainable and climate resilient use of natural resources in Guyana.

The IDB contracted the services of Conservation International (CI) to develop a microeconomic database of farms and farming households in Regions 5, 9 and 10. This database will enable statistical and econometric analysis to evaluate the ex-ante economic impact of the investment program and serve as the program baseline for the expost economic impact evaluation. The database will be established through field surveys of approximately 897 farms and farming households and will include beneficiaries and non-beneficiaries of the investment program.

A detailed TOR for the consultancy can be found in the Annex.

Conservation International awarded TCG a contract to develop the microeconomic database on the 1st July 2016. Training of field staff was conducted between the 13th and 15th July 2016 in Georgetown, and between the 18th and the 20th July 2016 in Lethem, Region 9. A survey pilot was conducted on 16th July, and data collection began in Regions 5 & 10 on the 18th July, in Region 9 on the 21st July 2016. Review and verification of the collected data was completed on the 13th August 2016.

Geography[1]

Mahaica-Berbice (Region 5) is a region of Guyana, bordering the Atlantic Ocean to the north, the region of East Berbice-Corentyne to the east, the region of Upper Demerara-Berbice to the south and the region of Demerara-Mahaica to the west (Figure 1). The Mahaica River runs along the region's western border whereas the Berbice River is its eastern border and the Mahaicony and Abary Rivers run south to north. Region 5, contains large settlements at Rosignol, Fort Wellington, Mahaicony and Helena. In 2012, the population of this region was recorded at 49,723 people.

Upper Takutu-Upper Essequibo (Region 9) is a region of Guyana bordering the region of Potaro-Siparuni to the north, the region of East Berbice-Corentyne to the east and Brazil to the south and west (Figure 1). Lethem is the lone town, with larger settlements at Annai and Aishalton. Geographically, it is the largest region of Guyana and it contains the Rupununi savannah which is located between the Rupununi River and the Brazilian border. In 2012, the population of this region was recorded at 24,212 people.

[1] Retrieved from https://en.wikipedia.org/wiki/Regions_of_Guyana

Upper Demerara-Berbice (Region 10) is a region of Guyana, bordering the regions of Essequibo Islands-West Demerara, Demerara-Mahaica and Mahaica-Berbice to the north, the region of East Berbice-Corentyne to the east, and the regions of Potaro-Siparuni and Cuyuni-Mazaruni to the west (Figure 1). It contains Guyana's second largest town, Linden, with other settlements including Ituni and Kwakwani. In 2012, the population of this region was recorded at 39,452 people.

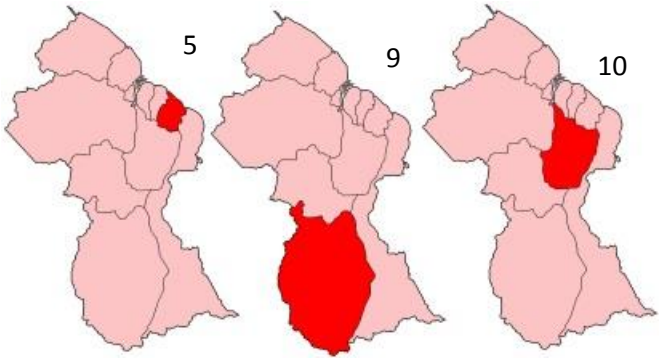

Figure 1 Administrative Regions of Guyana: Region 5, 9 & 10

Survey Methodology

The survey methodology was developed by the IDB with input from TCG.

Survey Instruments

The survey instruments were developed by the IDB with input from TCG, GLDA and the MoA. They were loaded onto tablets with which were used in the interviews conducted in the survey.

Two instruments were used in the survey: (i) the Agricultural Household Survey and (ii) the Community Leader Survey.

The Agricultural Household Survey captures information from respondents representing individual households in (8) modules numbered as follows: (0) Basic Information (1) Sociodemographic Information (2) Land/Plot (3) Assets (4) Livestock (5) Agricultural Production (6) Agricultural Production Assistance (7) Economic Activities of Household Members.

The Basic Information Module (0) focuses on geographic information about the region; NDC; and the main type of activity practiced by the household. It also included meta data about the field workers conducting the interviews; and the name and contact information of the respondent.

The Sociodemographic Information Module (1) collected information about each of the family members of the household, their relationships to the main respondent, their gender, age, marital status, place of birth and length of time living in the household over the previous year and their education status and literacy levels. This module also collected information about living conditions, and facilities in the locality.

The Land/Plot Module (2) collected information about the ownership status and general characteristics of family plots. Information on the main use of these plots is included here along with the type of problems encountered and water usage and storage. It also includes information about land conflicts, agricultural problems and agricultural practices.

Module 3 collected information about assets and in particular agricultural and non-agricultural assets.

Module 4 collected information about livestock. In particular, it focused on livestock inventory, production and annual operational costs. This module also collected information on households' involvement in aquaculture.

Module 5 collected information on agricultural production in general including both temporary and permanent crops, and the harvesting of forestry and environmental products.

Module 6 collected information about agricultural production assistance. In particular respondents were asked to provide information about the type of assistance received and the provider of such assistance and about what kind of assistance they would like to receive. They were presented both with general agricultural options and with options specific to various kinds of agricultural ventures.

Module 7 collected information about the economic activities and time use of all household members aged five or above. In particular, household members were asked to share information about their participation in a range of activities including: collecting water, collecting firewood, crop farming, livestock production, aquaculture production, forestry production, land preparation, fallow preparation, weeding, fumigation/pest control, sowing, irrigation, burning/fertilizing, harvesting, processing/storing and selling. This section also collected information about the type of

employment of each household member and it concluded with information about loans, credits and savings. Respondents were asked whether they received loans and credits over the last year, who provided the loans or credit and the amount and interest rates.

The Community Leader Survey is applied to a community leader or, where one cannot be identified or is unavailable, to someone knowledgeable about community agricultural practices and initiatives. This instrument contains four Sections: (1) Basic Information (2) Economic Activity and Public Infrastructure (3) Agricultural Characteristics (4) Price Estimates.

Sampling

Sample Allocation

An overarching issue of importance to sampling is that the administrative data about agricultural households in particular were not available. Though various bits of information are available, they are incomplete and using them would therefore lead to exclusion errors at the onset. Against this backdrop, the sample sizes per region were determined by the IDB based on the totals reported in the 2002 Population and Housing Census conducted by the National Bureau of Statistics (regions 5, 10), a list from the Ministry of Indigenous People's Affairs (Region 10), a list of Amerindian villages and their satellites from the Regional Democratic Council (Region 9). These sample sizes per region were set at 335, 350, and 219 households for regions 5, 9 and 10 respectively (see Annex). This is adequate for controlling errors but perhaps more importantly, the absence of administrative data made it challenging to ensure that the samples were representative of the regional populations of agricultural households.

Systematic Step Size Adjustment

Let

N_t= famer population size of region t

n_t= sample size of the region t

k_t= step size of the systematic procedure in region t

$k_t = (N_t/n_t)*c$

where c=5 is the cluster size per step in the systematic procedure.

The challenge of ensuring that the data are representative of the regional population of agricultural households was addressed jointly by the IDB and TCG. In particular, a two-stage sampling strategy was developed and applied within each region. This strategy was based systematic sampling of villages and cluster sampling of villages. At each step in the systematic procedure a cluster of 5 farming households were identified. The step size of the systematic procedure was therefore adjusted to accommodate the cluster selection. This procedure resulted in selection of 46, 45 and 30 villages in regions 5, 9 and 10 respectively (see Annex). Several of these were selected more than once based on the methodology developed to arrive at the required sample sizes.

The systematic arrangement of the villages was essentially an alphabetic arrangement by the name of the village. Therefore, although the arrangement was initially systematic, it ultimately offers no benefit to estimation beyond that

provided by a random sampling of villages insofar as no link between the names of the villages in a region and the agricultural variables is expected to exist.

Household Identification

In the absence of a list of farming households, identification was done in the field. In this regard, a random walk procedure was thought to be very inefficient given that not all households will qualify for selection. Such a procedure would require great amounts of time and effort to identify farming households. As an alternative, a process which capitalized on the relative collectivistic culture of the country wherein people know each other and where they live especially in the rural areas was employed. The interviewers went to the selected villages and contacted a first household, and thereafter rely on information obtained there to identify other, nearby farming households. In fact, information about the locations of other farming households was collected at each stop so that the interviewers had some guidance on where they should go next for interviews.

A risk inherent in this snowball approach is that the sample might ultimately be a list of friends. This was addressed by assigning several interviewers to a village at once and assigning them to begin working from different points in the village. Therefore, even though household identification snowballed from the first point of contact, several such nodes were activated concurrently within the same village to facilitate greater heterogeneity in the household identification process. This process is expected to control collegial correlation that might exist among the referring household and the next household to be visited.

The specific steps followed for this survey are as follows:

1. Enumerators proceed to the area to be surveyed and start at random points in the area that suggests a good spatial spread with multiple enumerators in the same area.
2. Enumerators identify a household and conducts interview
3. Enumerators ask household for potential other respondents and make an alphabetical list.
4. Enumerator selects from list a random respondent to interview and proceed to locate that household
5. Enumerator repeats steps 2 to 4
6. If Enumerator does not locate next household, enumerator moves to the next identified from the list.
7. Enumerator repeats steps 2 to 6 until quota of interviews is reached.

Before an interview is conducted, field Supervisors were presented with information about the villages to be surveyed and the corresponding number of interviews required for each village. They were also given the number of enumerators assigned to his/her team and to a particular village. Where multiple enumerators were assigned to an area, the field supervisor decided beforehand the number of interviews each enumerator must complete for that area.

The field supervisor assigned unique identifiers for each interview and communicated this with the respective enumerators. The field supervisors also identified the random starting points in the villages to be surveyed where each enumerator commenced their work. In cases where an enumerator located a household that met the selection criteria for households but the household did not agree to participate, the enumerator recorded this interview and moved on. However, this interview did not count as one of the interviews required of the enumerator and was hence ultimately replaced.

The target and successful interviews per region resulting from these procedures are shown in Table 1. In each case, the completed number of interviews exceeded the target by a few interviews. This is due to the fact that some oversampling was done to compensate for shortfalls and for potential rejections. This would not unduly distort the

results since the numbers oversamples are quite small and also because to begin with there were uncertainties about the totals used to calculate the sample sizes. The additional data are therefore retained in the data sets.

Table 1 Interviewing results

Region	Number of Villages Identified	Number of Interviews Identified	Number of Interviews Completed
Region 5	46	330	332
Region 9	45	350	357
Region 10	30	219	222
Total	110	899	911

In some villages the required number of respondents could not be identified. This was addressed by oversampling in other villages where this was possible. Wyngaarts Lust in the Berbice River (Region 5) also could not be sampled they appeared to be no farmers in that area, as such 4 interviews were done in Blairmont and one from Ithaca to make the sample of 5. It was not possible to sample in the village of Quiko in Region 9. This village was replaced by Meriwau due to its ease of access. The team was also not granted access to Rupertee Village and again additional respondents were identified in neighbouring villages to compensate for this.

In Region 10, there were cases in which farmers could not be located or the villages identified appeared uninhabited. For example, in Hibibia Creek there were no farmers and so to compensate for this oversampling was done in Muritaro. Zealandia was reported as uninhabited by Regional Coordinator and so oversampling to compensate for this took plane in Kimbia and Wikki. In some cases farmers were unwilling to participate. This occurred for example in De Endragt, De Velde and Fort Nassau.

Field Work

Survey Pilot

A pilot of the Agricultural Household and Community Leaders survey was conducted on July 16, 2016 from 11:00 am to 7:00 pm in the Mahaicony Branch Road, which is a 6 km stretch of road between L'Enterprise village and Wash Clothes Village that parallels the Mahaicony River in Region 5. The area is home to many small rice producers and livestock farmers, interspaced with small cash crop farmers. The pilot team comprised 2 Regional Coordinators, 7 Supervisors, 21 Enumerators, the Pilot Leader and TCG Support Staff.

The pilot identified the following challenges:

1. The inconsistent and sometimes non-functioning GPS feature on the Survey instrument/tablets.
2. A missing "Dollar" value option for Module 4/Section 3 (4.3)
3. The incorrect appearance of sections of the survey that should be "skipped" based on a prior selection. For example
    a. employment data were requested for a child family member below age 1 and
    b. though a respondent indicates they do not practice Forestry, Aquaculture etc. these sections come up for completion
    c. When no assistance was selected as option the instrument still presented the type of assistance needed option
    d. Section 3 in the Community leaders survey where the farmers responded with no assistance required the instrument did not skip but presented the type of assistance required option

4. Farmers were responding in units such as bundles and bags for amount of produce. These units are not available
5. Use of Tablet: A small number of enumerators were not very comfortable with the survey instrument on the tablet. In one case an entire interview was lost. Additionally, a small number of enumerators forgot to complete all sections of the survey that was required.
6. Respondent Fatigue: Enumerators and supervisors reported that respondents became tired during the interview and in some cases, the respondents broke off the interview
7. Duration of Interviews: Some interviews took longer than average because households were larger and some dealt with many more crops and livestock than others. In a small number of cases, interruptions by visitors and family members extended survey completion time.
8. Incomplete Survey Items/Skips: As noted above many items did not provide the appropriate type of response and some items that should have been skipped still appeared for enumerators to complete. This caused delays and extended the field work for enumerators significantly.
9. Data Quality Check: Supervisors were generally unable to spend as much time as is required to check thoroughly completed interviews. This was partly because they were themselves learning to use the tablets and were also getting used to the protocols and learning about the process.
10. Calculations: Enumerators in many instances were required to manually calculate totals

Based on the experiences of the survey pilot the following recommendations were made:

1. The GPS proved to be a major challenge. In the context of the survey it might be better to not have it completed. The absence of the GPS location will not affect the general location of the farmers because villages are known and so general location is easy to figure out.
2. Include "dollar" as an option for Module/Section 4.3
3. Edit survey instrument to cater for correct execution of skips
4. Enumerators should try their best to work out a reasonable estimate in lbs/kgs or appropriate unit though farmers may use other units
5. Edit the survey instrument to skip appropriately.

The final modifications of both instruments and of the enumerator manual were completed on the 17th July 2016 and a comprehensive report on the survey pilot was submitted to CI and the IDB on the 18th July 2016.

Substantive Survey: Field Implementation and Logistics

Each of the three surveyed regions (5, 9, and 10) was assigned a team to conduct interviews in the selected villages. In particular, the teams comprised of a Regional Coordinator who was responsible for overall logistics and implementation of the field work and for quality management of the process. Each Regional Coordinator supported teams comprising a Supervisor, and usually, three Enumerators. The Supervisors were responsible for a particular team of Enumerators for the assigned villages surveyed.

Enumerators were assigned a number of interviews to be completed for each village by the Supervisors. The Supervisors were in turn responsible for ensuring that all surveys were complete and that enumerators were following the protocols set out for interviews. They were also responsible for verification and validation of the data collected and either approved correctly completed interviews or returned to enumerators' interviews that required comments or further work. The Supervisors reported to the Regional Coordinators on the progress of interviews with periodically.

The Regional Coordinators conducted verification and validation of interviews that were approved by Supervisors to ensure quality. Where problems were identified with the data collected, the Regional Coordinators returned interviews to Enumerators for further comments and clarifications. Completed interviews that met the requirements set out by the project were finally approved by the Regional Coordinators.

Region 5

The field work for the survey in Region 5 commenced on July 18 2016 and concluded on July 30 2016 with some additional work on quality assurance conducted up to and including August 07, 2016.

The Region 5 team members from Region 4 met at TCG's Georgetown office every day to collect the field kits with charged tablets for supervisors. They met at a common point every morning (Gas station in Mahaicony) and grouped with their team members. Here they mapped out the areas that were going to be sampled and interviewed and decided on the allocation of teams to villages. They also checked their field kits and tablets and worked out other logistics. The team departed from this point to their assigned villages to conduct interviews. Once the quota was completed for the day (teams aimed for 30 interviews per day), the supervisors checked off completed surveys, packed field kits and returned them daily to the TCG office. This procedure was followed for all the interviews done in all communities accessible by road. For communities in the Mahaicony River, the team sampled areas on the way to St Francis, overnighted in the mission and then conducted the interviews there.

Some data collectors felt uneasy about speaking to farmers in Belladrum because there were talks of a protest and blocking of the roads. The area was flooded and the farmers were frustrated. Nevertheless, the Regional Coordinator returned later with a team and surveyed this area.

Region 9

The survey in R9 commenced on the afternoon of Tuesday July 19 in St Ignatius. All of the teams for Region 9 participated in this exercise. This continued the following day (July 20) for all of the teams in the villages Moco Moco and Kumu. On the afternoon of July 20 the teams proceeded to their assigned sub-districts to commence fieldwork.

The fieldwork in this region was completed by August 03. South Pakaraimas was completed first, followed by North, Deep South, Central and then South Central. The team in the Deep South was asked to conduct additional interviews which were completed from Aug 07 – 08. The enumerator teams were generally out of communication during the survey except for North and Deep South where there were telephone links. There were no end of day logistics to be dealt with (there couldn't be because of the terrain and communication limitations); this had to be done by the supervisor.

Supervisors in the North and Deep South were in regular contact with Regional Coordinator. However, those in the South Central area found it particularly difficult getting around because of high water levels in the rivers (Rupununi, Sand Creek, and Sawariwau) that had to be crossed. In the Central area, travelling to communities in the river (Katoka, Semonie) was slow. Achawuib in Deep South was also challenging to access. In the South Pakaraimas, similar challenges were experienced for Yorung Paru and Pai Pang.

Questionnaires from the North were uploaded in the North at Surama, Rock View Hotel and Bina Hill Institute. In Deep South completed questionnaires were uploaded in Aishalton at the Catholic Church. All other teams uploaded at Conservation International (CI), Lethem office. Fieldworkers in the South Central area attempted to upload from Shulinab but this was unsuccessful as there were issues with using the Internet service.

The village of Rupertee (represented by the Senior Councillor) refused to allow the interviewers to enter to conduct the interviews on the grounds that he was not given 2 weeks' notice. Consequently, additional interviews were done in Aranaputa to compensate for this problem.

Community surveys were done with community leaders, either Toshaos, Senior Councillors or Councillors.

Region 10

The field work for the survey in Region 10 commenced on the July 18 and concluded on July 27. August 06 and 07 were used to conduct some additional interviews.

The Regional Coordinator used the evening before the next day's work to discuss areas to be interviewed and sample targets with the team leaders. Sometimes this was done in person where possible and at other times via email. The teams met at Watooka House with Regional Coordinator in the mornings and the sample targets and areas to be surveyed were again discussed with everyone. Any queries from the team were also tabled for discussion. At the end of the day, all teams returned to Watooka House where they reported on any difficulties and handed in their sign-off sheets. In terms of verification and reviewing, respondents were contacted directly if there were any errors in the data collected.

All Region 10 team leaders were from the region and were thus able to use their local knowledge to identify community leaders (in Linden environs community leaders were either agricultural extension officers or leaders of the community). In the Amerindian reservations, they interviewed either the Toshaos themselves or a senior member of the Village Council.

In general there were some issues with many of villages in Region 10. In some instances there were no farmers or very few/limited number of farmers. In addition some farmers were unwilling to talk or unwilling to share income data.

Community Leader Survey

In Region 9 and 10, the Toshaos (village leaders) for the surveyed villages were interviewed by the field supervisor for each of the identified villages. In agreement with the IDB, no Community Leaders interviews were conducted in Region 5 as anecdotal evidence suggests that there are few community agricultural initiatives in this region. In the absence of a Toshao or community leader, alternates with knowledge of community agricultural initiatives were identified as a respondent of this survey.

Data Confidentiality

Here a brief note with regards confidentiality. In line with best practice we have indicated to all respondents that the information provided by them will be treated confidentially. CI and IDB must ensure that where the database is shared there are sufficient safeguards to maintain confidentiality. Where the intention is to share the data openly, the main issue is the need to preserve anonymity of individuals and households. We suggest that in this regard, the names, addresses, phone numbers etc. should first be removed from the data. A second issue stems from the fact that in some villages surveyed, the number of households is so small that an identification of the respondent is possible based on the information available in the database. To deal with this, the names of the communities should be excluded from the data along with identifying information about the community leaders interviewed. The communities or districts should be numbered and the villages within them also numbered to preserve the hierarchical nature of the data but those numbers should not be identified by text labels that indicate the names of the villages and communities.

Description of Data

This description is meant to give an overview of some of the main variables measured in the survey. It is not an exhaustive summary as many variables are not included here. The overarching aim is to provide a sense of where agricultural households are found, their practices and problems, what they are engaged and the scale of their operations and what assistance the need.

The survey was conducted in three administrative regions; regions 5, 9 and 10, of Guyana and realized samples of 322, 357 and 222 respectively (Table 2) in these regions. The overall realized sample size id therefore 911 households.

Table 2 Regional Sample Sizes

Region	Frequency	Percent
Region 5	332	36.44
Region 9	357	39.19
Region 10	222	24.37
Total	**911**	**100**

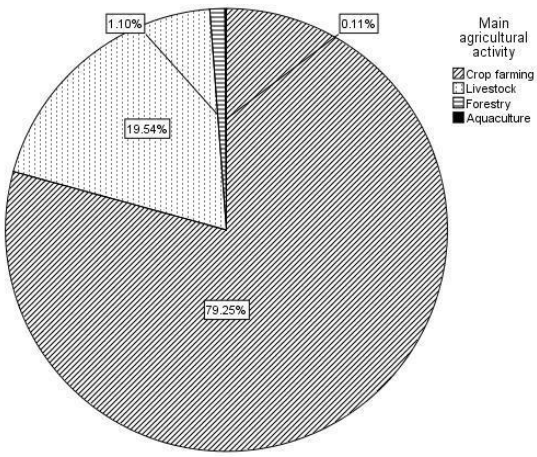

Figure 2 Main Agricultural Activity of Households

A large majority of the households (79.25%) are engaged in crop farming as their major agricultural activity across the regions whereas a very small minority (0.11%) are primarily engaged in acquaculture (Figure 2). In addition, close to 20% of the households are primarily engaged in livestock farming and 1.1% are chiefly engaged in forestry activities.

At the level of the region, crop farming remains the most popular main agricultural activity (see Figure 3). This is representative of almost 96% of the agricultural households of Region 9 and of between 68% and 72% of the agricultural households in regions 5 and 10. As whould be expected then, the other farming activities (livestock, forestry and aquaculture) are the main activities for very small percentages of the agricultural households in region 9. However, forestry and aquaculture are unpopular in general as the main agricultural activity. Less than 4% of the

agricultural households in each regoin report these as their main activity with acquaculture in particular occurring only in region 9 and forestry absent from region 5. Livestock rearing is the main activity of some agricultural households in each of the regions, but whereas approximately 5% of the agricultural households in region 9 report this as their main activity, approximately 32% and 25% of the agricultural households of region 5 and 10 respectively indicated that livestock rearing is their main agricultural activity.

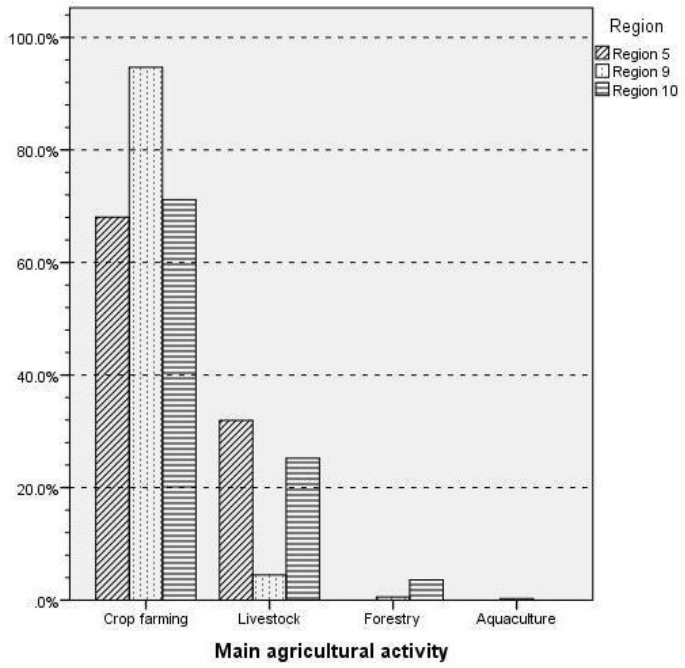

Figure 3 Main Agricultural Activity of Households by Region

In considering the reporeted agricultural activities, it is important to realie that agricultural households may be engaged in a combinatin of agricultural activities. The information presented here focuses only on what the households regard as their main activity. Agricultural activities may also be determined to some extent by the geographical context. Forestry activities in particular appears to be influenced by proximity to forests which can explain its absence as the primary agricultural activitiy of households in region 5.

Table 3 Size of Agricultural households

Group	N	Minimum	Maximum	Median	Mean	Std. Deviation
Overall	911	1	15	9	4.54	2.24
Region 5	332	1	14	4	3.92	1.88
Region 9	357	1	11	5	5.36	2.23
Region 10	222	1	15	4	4.15	2.36

Agricultural households have between 1 and 15 occupants (Table 3). The average household size is 4.54 with a median of 9 at the aggregiate level. The median drops to 4 in regions 5 and 9 and to 5 in region 10, but whereas the average number of occupants drops, relative to the overall average, to 3.92 in region 5 and to 4.15 in region 10, it increases to 5.36 in region 9.

Agriculture Land Area

The agricultural households have access to between 1 and 8 plots of land for agricultural purposes but the range of plots is narrower in region 9 and region 10 than in region 5 (Figure 4 Table 4). That notwithstanding, the average number of plots is largest in region 9 (Table 4) as larger percentages of the agricultural households tend to have access to more than one plots than in the other regions. Nevertheless, the mean number of plots to which the households have access for agriculture lies somewhere between 1 and 2 on average.

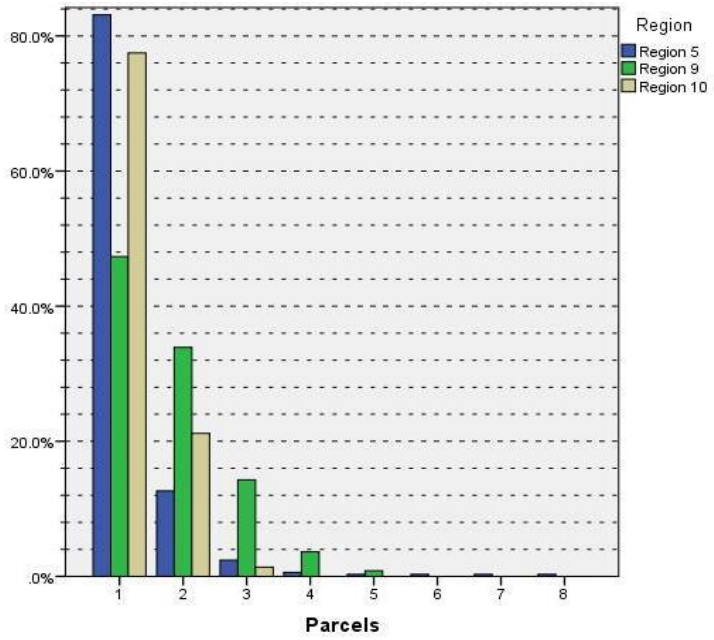

Figure 4 Plots for Agriculture

Table 4 Average Number of Plots

Group	n	Minimum	Maximum	Mean	Std. Deviation	Avg. Area (acres)
Combined	911	1	8	1.45	0.80	6626.93
Region 5	332	1	8	1.26	0.77	2623.90
Region 9	357	1	5	1.77	0.89	1199.10
Region 10	222	1	3	1.24	0.46	2803.93

The agricultural plots cover a total area of approximately 2623.90, 1199.10 and 2803.93 acres in regions 5, 9 and 10 respectively based on the reports provided by the households with corresponding averages of 7.90, 3.36 and 12.63 acres per household in regions 5, 9 and 10 respectively.

Agricultural Practices

Of the 20 agricultural practices presented, five are practiced by at least 10% of the agricultural households (Figure 5). At the higher end of popularity are intercropping (approximately 34%), crop rotation (approximately 27%) and controlled burning (approximately 26%). However, approximately 19% of the households indicated that they save firewood for cooking whereas just about 10% use mulching.

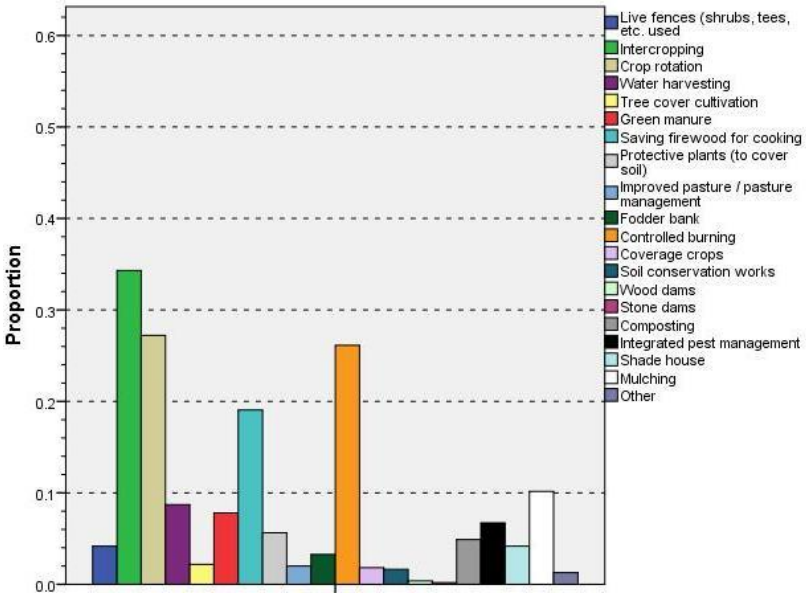

Figure 5 Agricultural Practices

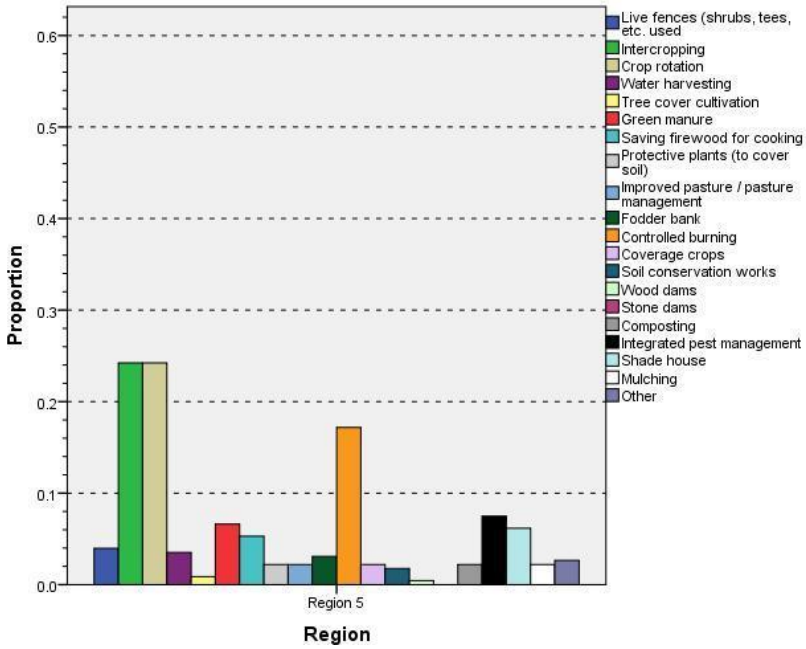

Figure 6 Agricultural Practices in Region 5

At the lowest end of popularity, are tree cover cultivation, pasture management, coverage crops, stone dams and wood dams which are practiced by at most 2% of the agricultural households with stone dams in particular being completely absent and wood dams being practiced by less than 1% of the households (Figure 5). Fodder bank is practiced by approximately 3% of the households whereas live fences and shade house are used by approximately 4% of the households and composting, protective plants and integrated pest management are used by approximately 5%, 6% and 7% of the households respectively. Finally, water harvesting and green manure are used by approximately 9% and 8% of the households respectively.

The pattern in the various practices is somewhat similar in region 2 although there are some noticeable changes. For example, the proportion using intercropping drops to approximately 24% whereas the proportion saving firewood for cooking drops to approximately 5% and the proportion practicing mulching drops to approximately 2%. The use of water harvesting also drops to approximately 4%. The drop in the percentage saving firewood might reflect relative greater urbanity of region 5 as a whole than the other two regions.

The results for region 9 show a markedly different pattern in that a much smaller variety of agricultural practices are employed (Figure 7). There is no use of live fences which might be related to electricity supply in the hinterland and to the low prevalence of livestock rearing, but there is also no reported use of water harvesting, fodder bank, coverage crop, soil conservation works, wood dams, stone dams, composting and shade house. Furthermore, tree cover cultivation, green manure, protective plans and pasture management are identified by less than 1% of the households.

Saving firewood is the most popular practice in region 9 wherein it is done by approximately 43% of the agricultural households. Next is controlled burning (33%) followed by intercropping (26%) and then crop rotation (19%). Notably, integrated pest management (approximately 10%) and mulching (approximately 11%) are practiced by farming households and these are done at higher rates than in region 5.

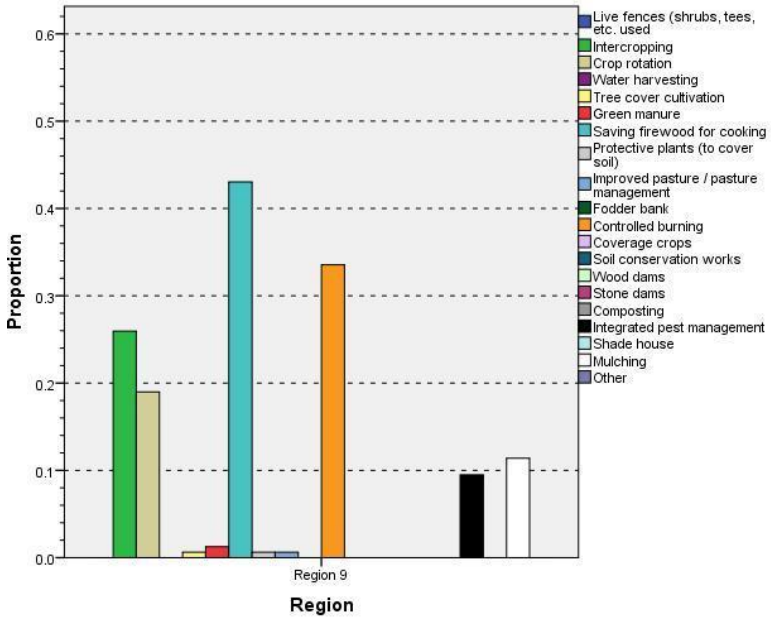

Figure 7 Agricultural Practices in Region 9

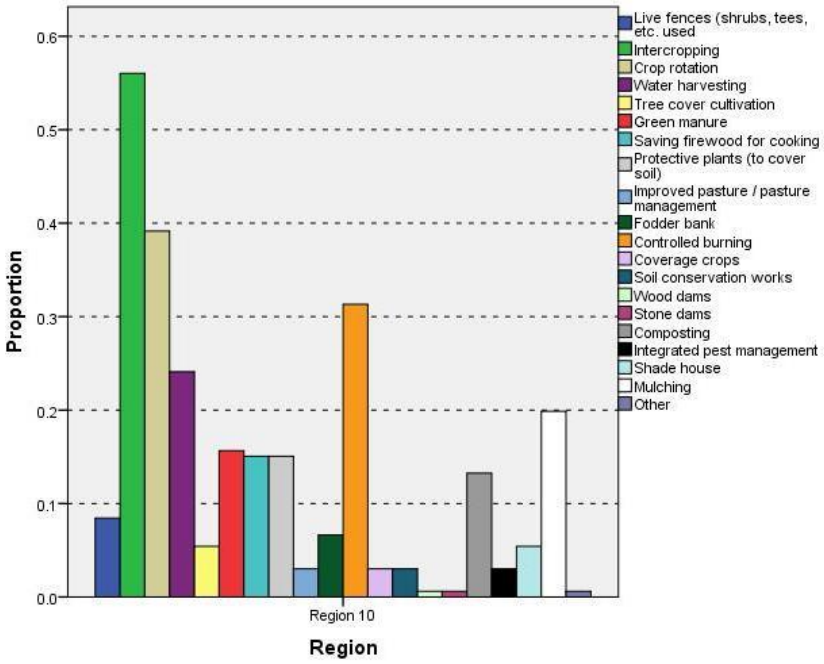

Figure 8 Agricultural Practices in Region 10

Each of the agricultural practices are done in region 10 (Figure 8). In fact, it is the only region in which the use of stone dams (though still unpopular) is recorded. There are also marked increases in the popularity of some practices that are not very popular elsewhere. These include water harvesting (approximately 25%), green manure (approximately 16%), protective plants (approximately 15%), composting (approximately 13%) and mulching (approximately 20%). In addition to this, approximately 55% of the households practice intercropping whereas approximately 39% practice crop rotation and approximately 32% use controlled burning.

Table 5 Other Agricultural Practices

Other Practice	Frequency
Concrete wall to store water for the fish	1
Mud dam	9

The category, "other" was selected by households in regions 5 and 10. These other practices include the use of mud dams and erecting concrete walls to keep fish (Table 5).

Agricultural Problems

The agricultural households have experienced several problem in the last year (June 2015 – June 2016), which have affected production, but some kinds of problems have had this impact (Figure 9). In particular, theft of machinery or tools have not affected production at all and theft of agricultural inputs has not affected production in region 9, less than 4% of the agricultural households of regions 5 and 10 have indicated that theft of their agricultural inputs has affected production. Theft of agricultural products has also affected production of less than 5% of the households in each region.

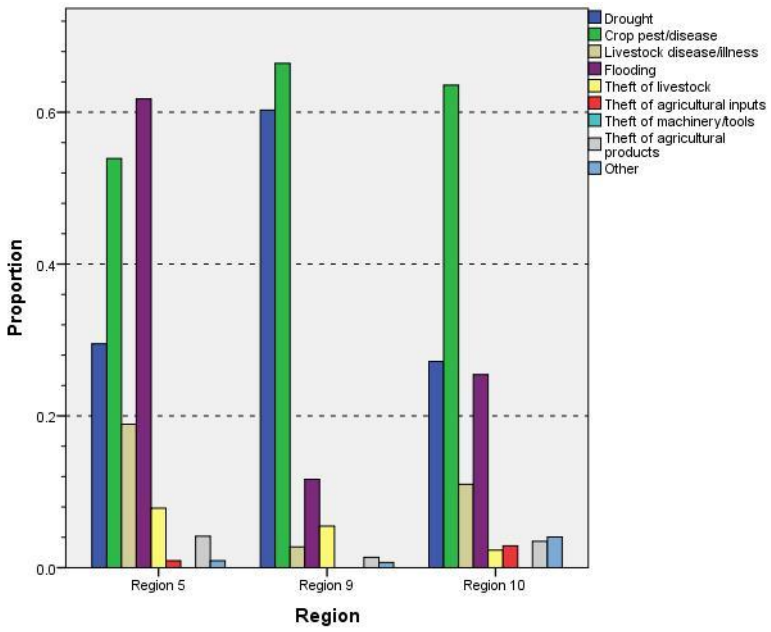

Figure 9 Agricultural Problems Experienced in the Last Year

Across the region, crop pest/disease has affected the production of large percentages of the households. At least 64% of the households in regions 9 and 10 reported this whereas approximately 54% of the agricultural households in region 5 indicated that problems with crop pest/disease have affected production. Drought has also had an impact in each region, reaching to 6% of the households in region 9 but affecting agricultural production of approximately 30% and 28% of the households in regions 5 and 10 respectively. Flooding has also affected agricultural production more than 60% of the households in region 5 and of approximately 25% of those in region 10 but approximately 12% of the households in region 9.

Though livestock disease/illness and theft of livestock have affected production in each region in the last twelve months, these have impacted on production of less than 20% of the households. In particular, livestock disease has affected production for approximately 19% of the households in region 5, but this dropped to approximately 3% in region 9 and to approximately 12% in region 10 (Figure 9). Actual theft of livestock appears to have had relatively low impact overall as it has affected the production of less than 8% of the households in each region.

Assets

The agricultural households were asked about both agricultural and non-agricultural assets owned in the last year and a wide variety of both types of assets were presented to them.

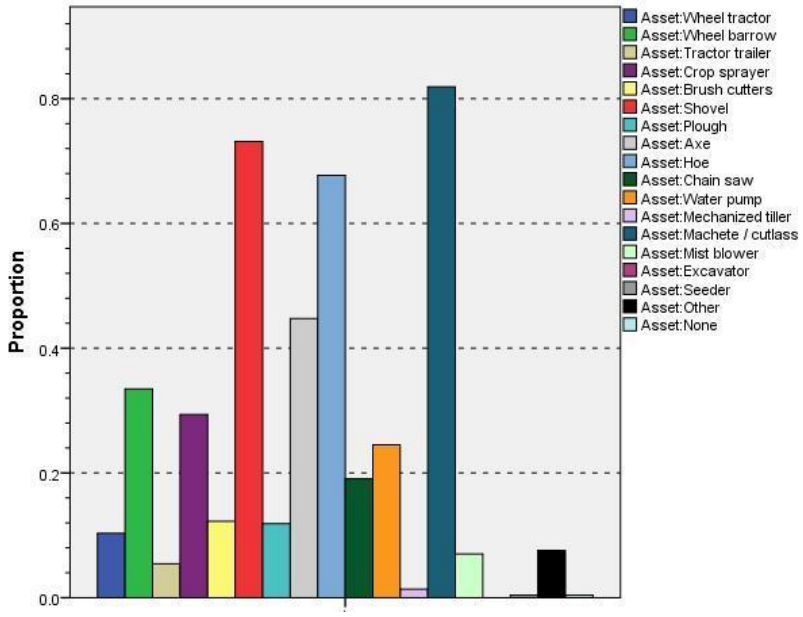

Figure 10 Ownership of Agricultural Assets

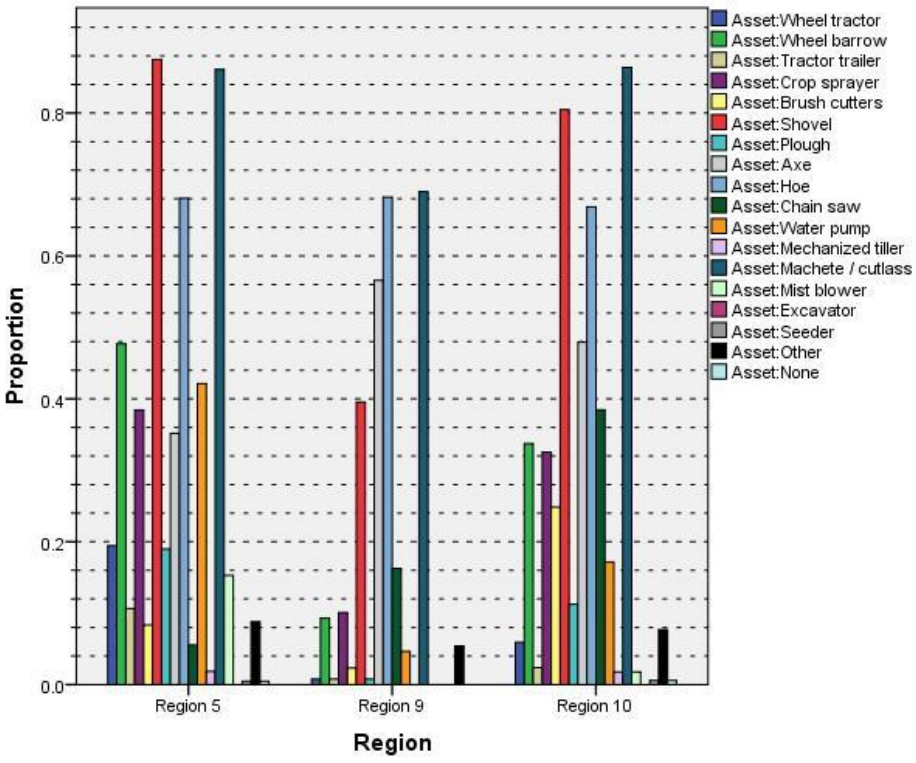

Figure 11 Ownership of Agricultural Assets by Region

The most popular agricultural asset is the cutlass/machete which is owned by more than 80% of the households. This followed in popularity by the shovel (approximately 72%) and the plough (approximately 68%) which are the remaining two that are owned by more than half the households overall.

The only other agricultural asset that is owned by more than 40% of the households is the axe whereas the wheelbarrow (approximately 34%), crop sprayer (approximately 28%) and the water pump (approximately 25%) are all owned by more than 20% of the agricultural households.

All other assets are owned by less than 20% of the households. Notable among these are the mechanized tiller (approximately 2%), excavator (0%), seeder (almost 0%), mist blower (approximately 8%), tractor trailer (approximately 5%) which are at the lowest end of popularity. In addition, the wheel tractor (approximately 10%), brush cutter (approximately 12%) and plough (approximately 12%) are also owned by small percentages of agricultural households. Overall, the agricultural households appear to have a low technology approach to their operations and this holds true at the level of the region except perhaps for a marked increase in the percentage of agricultural households that own a water pump in region 5 (Figure 11).

Several non-agricultural assets were also presented to the households during the survey. Among them, mobile phones, television sets and gas ovens emerge as the most popular non-agricultural assets and are owned by more than 60% of the households whereas radios/stereo sets, DVD players/VCRs, refrigerators and bicycles are owned by between 40% and 50% of the households. The remaining non-agricultural assets are owned by smaller percentages of the households. These include freezers, electric fans/ventilators, computers/laptops, blenders and boats which are owned by between 20% and 40% of the households and electric ovens, washing machines, motorcycles, cars and outboard engines. Notably, a very small percentage of the households own none of the assets.

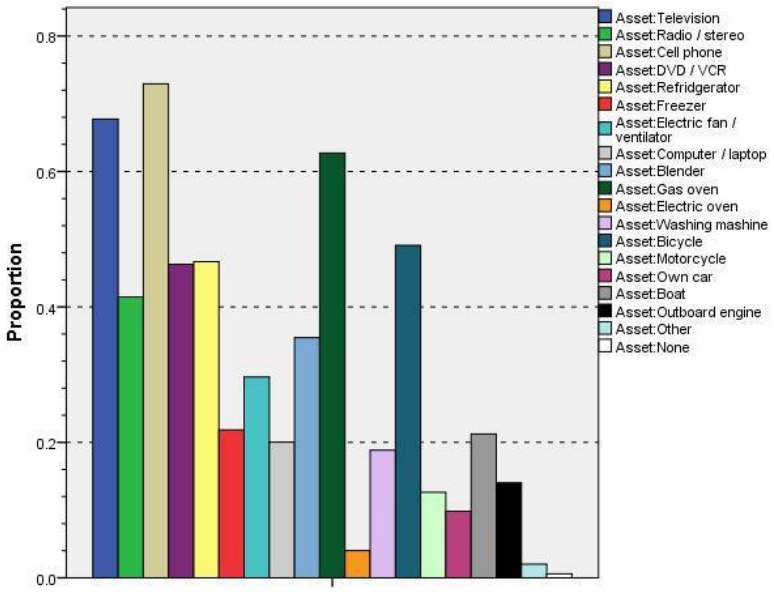

Figure 12 Ownership of Non-Agricultural Assets

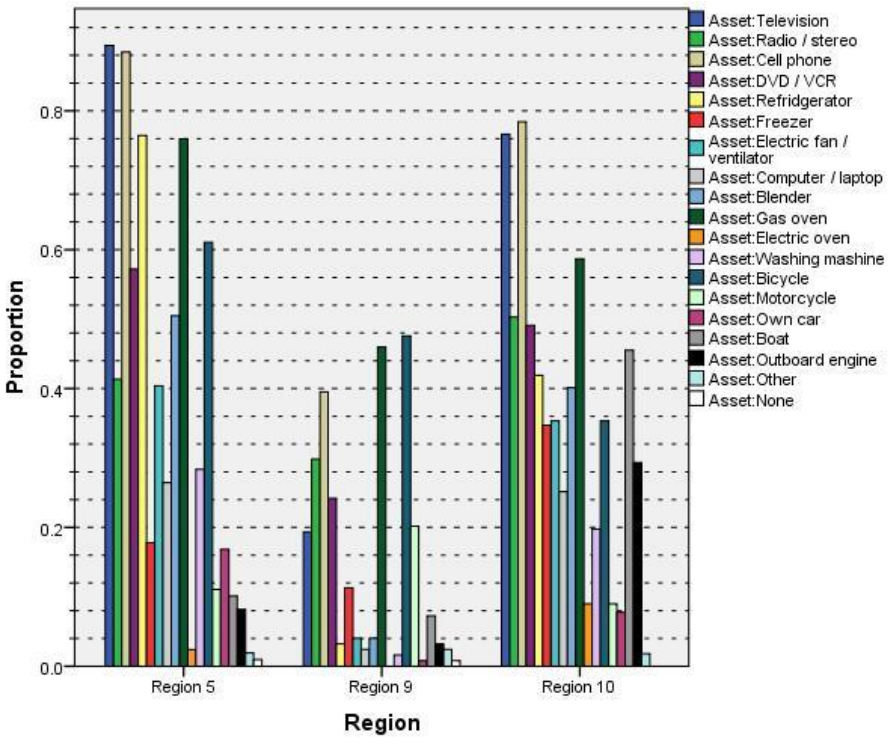

Figure 13 Ownership of Non-Agricultural Assets by Region

At the regional level, the ownership of non-agricultural assets is lowest in region 9 overall wherein no particular asset is owned by as many as 50% of the households. The bicycle which is owned by approximately 47% of the households is the most popular asset in region 9. It is also interesting to note that a computer is owned by less than 4% of the households in this region in comparison to approximately 26% and 25% of the households in regions 5 and 10 respectively.

Livestock

Overall, approximately half of the agricultural households own livestock (Figure 14).

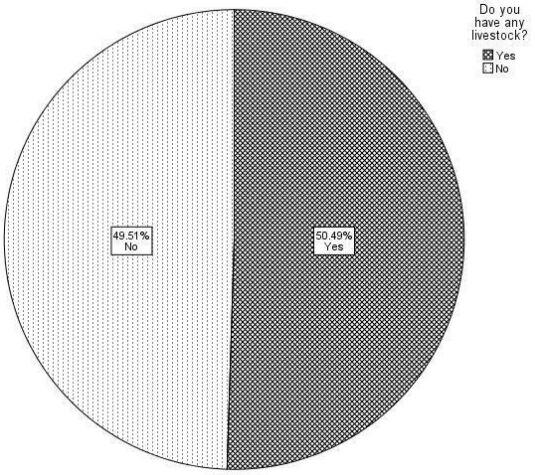

Figure 14 Have Livestock

Livestock ownership occurs predominantly in Region 9 where this is true for approximately 63.87% of the households (Figure 15). This contrasts sharply with the previously described situation wherein livestock rearing is not the main activity or many households in this region (see Figure 3). This means that although most of the households own livestock, the concentrate mainly on other agricultural ventures; particular crop farming in this case. The percentages of households that report having livestock are somewhat similar in regions 5 and 10. These percentages lie between 40% and 45%.

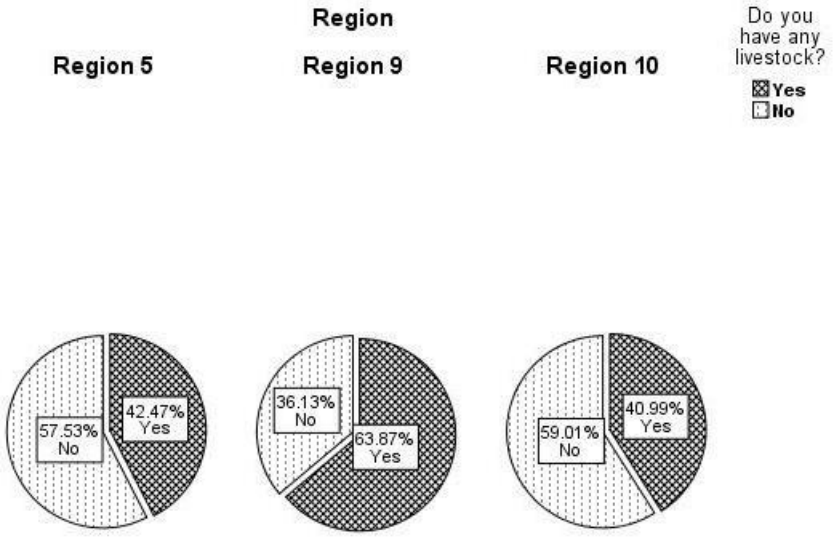

Figure 15 Livestock Ownership by Region

But what kind of livestock do the households own? Chickens is most popular and are reared by approximately 48% of the households overall. This is followed in popularity by cows which are owned by approximately 39% of the

households. The only other livestock that is owned by more than 30% of the households is pigs which are reared by approximately 31% of the agricultural households that own livestock (Figure 16). In the breakdown, the category cows was disaggregated into heifers, bulls, young bulls and calves.

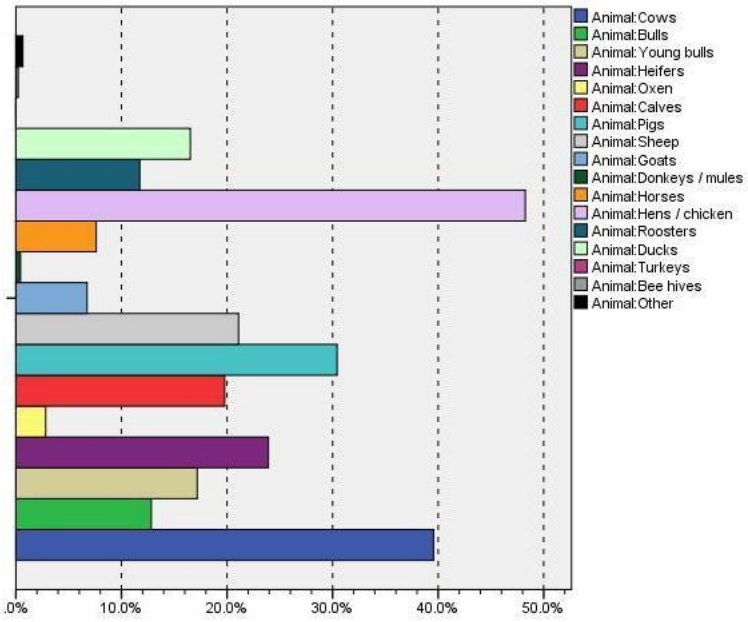

Figure 16 Livestock Owned Overall

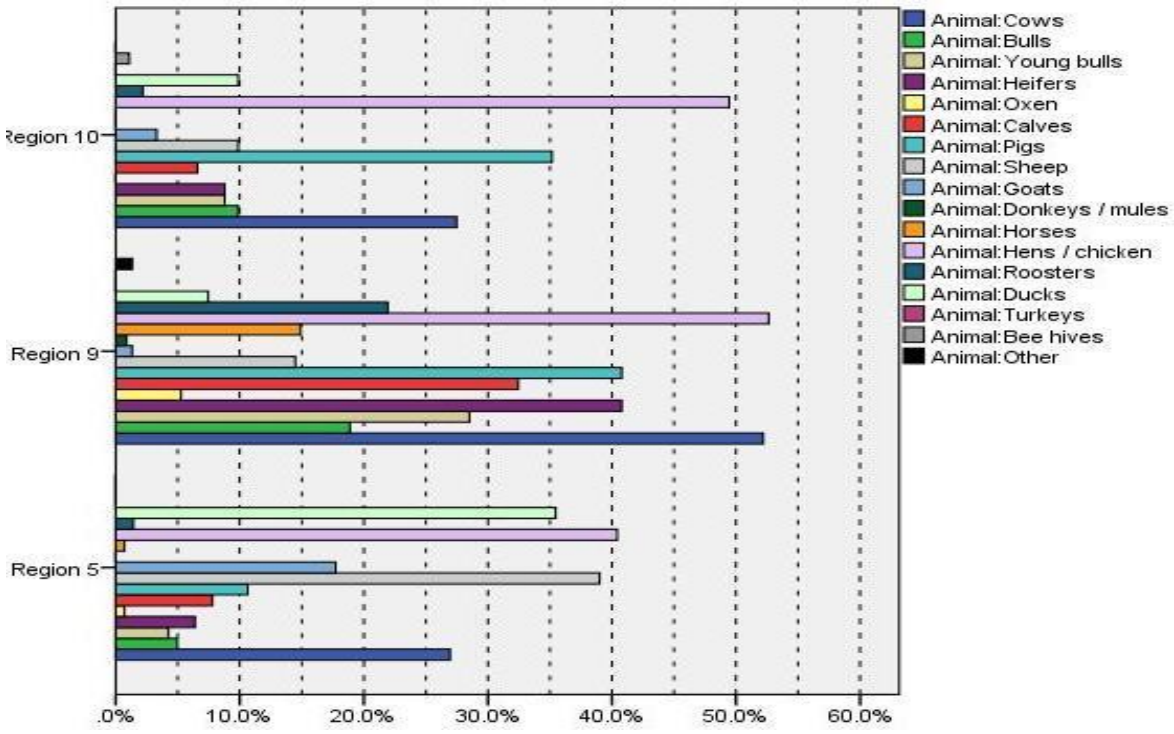

Figure 17 Livestock Owned by Region

Sheep and heifers are owned by approximately 21% and 24% of the households respectively whereas calves, young bulls, ducks, bulls (mature) and roosters are owned by between 10% and 20% of the households. The remaining animals – bees, horses, donkeys/mules goat and oxen – are all owned by less than 10% of the households whereas none of the households reported owning turkeys.

The comparison of livestock categories by region reveals some important differences in distribution (Figure 17). Cows and all its subcategories are much more likely to be owned by agricultural households in region 9 than those in regions 5 and 10. Goats are sheep are most likely to be reared by households region 5 whereas pigs were encountered more often in regions 9 and 10 where they are reared by approximately 41% and 35% of the households respectively. Horses are much more popular in region 9 where perhaps they might be used for transportation. Though chickens are popular everywhere, they are owned by approximately 41% of the households in region 5, but by nearly half of the households in region 10 and by approximately 53% of the households in region 9. However, ducks are much more popular in region 5 than elsewhere.

Table 6 Livestock Populations

Livestock	Number of Households	Mean Per Household	Median Per Household	Std. Deviation	Minimum	Maximum
Cows	182	13.78	6.5	19.43	0	157
Bulls	59	2.73	2	2.85	0	15
Young bulls	79	3.46	3	2.92	0	15
Heifers	110	7.11	4	8.96	0	58
Oxen	13	2.69	2	2.50	1	10
Calves	91	4.47	3	4.89	0	23
Pigs	140	14.69	8	21.87	0	150
Sheep	97	29.97	17	35.94	0	200
Goats	31	23.16	20	19.49	0	97
Donkeys / mules	2	2.00	2	1.41	1	3
Horses	35	6.37	4	7.84	0	40
Hens / chicken	222	103.90	23	404.14	0	5000
Roosters	54	9.93	3.5	18.75	0	106
Ducks	76	72.70	35	91.37	0	500
Turkeys						
Bee hives	1	5.00	5		5	5
Other	3	6.33	6	5.51	1	12

For a closer look at livestock, attention is focused on the average number of animals per household and the corresponding totals. Detailed information on the averages, and medial are presented in Table 6 to Table 9 and the means are further compared based on Figure 18. In the subsequent figure presented (Figure 19) the point estimates of the total livestock quantities are compared between the regions.

Table 7 Livestock Populations Region 5

Livestock	Number of Households	Mean Per Household	Median Per Household	Std. Deviation	Minimum	Maximum
Cows	38	20.61	10	30.29	0	157
Bulls	7	1.71	1	0.95	1	3
Young bulls	6	4.83	5	3.06	1	9
Heifers	9	14.44	12	11.28	3	40
Oxen	1	10.00	10		10	10
Calves	11	5.64	3	7.16	0	23
Pigs	15	44.20	20	48.95	3	150
Sheep	55	38.98	25	39.71	3	200
Goats	25	24.04	16	20.91	3	97
Donkeys / mules						
Horses	1	10.00	10		10	10
Hens / chicken	57	111.79	50	170.31	0	1000
Roosters	2	8.00	8	9.90	1	15
Ducks	50	98.44	60	102.42	0	500
Turkeys						
Bee hives						
Other						

Table 8 Livestock Populations in Region 9

Livestock	Number of Households	Mean Per Household	Median Per Household	Std. Deviation	Minimum	Maximum
Cows	119	10.68	6	14.58	0	85
Bulls	43	2.70	2	2.65	0	10
Young bulls	65	3.23	2	2.66	0	10
Heifers	93	5.84	4	6.86	0	40
Oxen	12	2.08	2	1.24	1	5
Calves	74	4.24	3	4.60	0	20
Pigs	93	10.24	7	11.37	0	60
Sheep	33	19.21	10	29.14	0	164
Goats	3	18.67	21	17.62	0	35
Donkeys / mules	2	2.00	2	1.41	1	3
Horses	34	6.26	4	7.93	0	40
Hens / chicken	120	19.66	15	20.46	0	160
Roosters	50	9.42	3	19.20	0	106
Ducks	17	14.71	8	16.29	0	50
Turkeys						
Bee hives						
Other	3	6.33	6	5.51	1	12

Table 9 Livestock Populations per Household in Region 10

Livestock	Number of Households	Mean Per Household	Median Per Household	Std. Deviation	Minimum	Maximum
Cows	25	18.16	13	15.64	3	60
Bulls	9	3.67	3	4.39	1	15
Young bulls	8	4.25	3.5	4.53	1	15
Heifers	8	13.63	8	18.59	2	58
Oxen	0					
Calves	6	5.17	5.5	3.66	1	10
Pigs	32	13.81	9.5	14.04	0	60
Sheep	9	14.33	15	12.42	0	34
Goats	3	20.33	23	9.29	10	28
Donkeys / mules						
Horses						
Hens / chicken	45	318.56	85	846.01	0	5000
Roosters	2	24.50	24.5	6.36	20	29
Ducks	9	39.22	30	30.64	10	100
Turkeys						
Bee hives	1	5.00	5		5	5
Other						

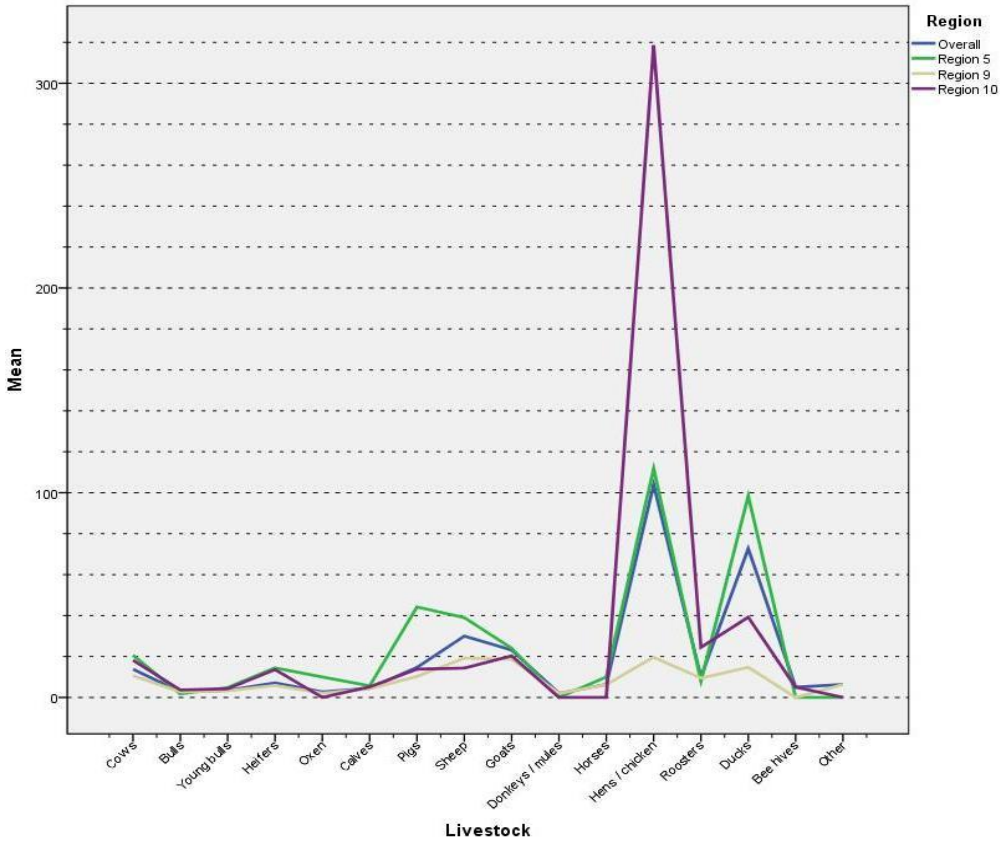

Figure 18 Mean Livestock Numbers

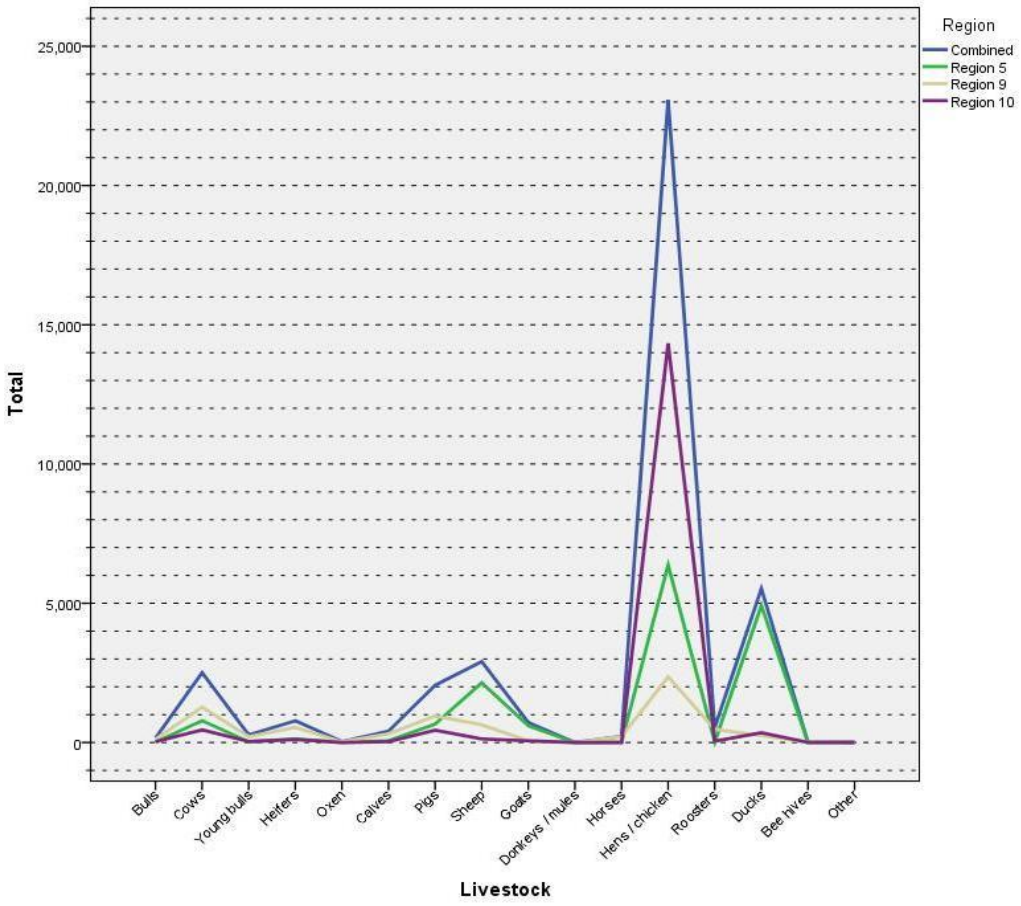

Figure 19 Total Livestock Numbers

The average livestock quantities per household is somewhat similar at the aggregate level and region 5, but the mean for region 9 generally lies below that of the other regions for most of the animals. Though the averages are low in general, there are noticeable spikes in the means for pigs, ducks and especially hens/chickens. The mean for pigs and ducks are largest in region five, whereas the mean for hens/chickens is largest in region 10 and by a very wide margin.

When the totals are examined based on the reports of the households, a few points on the chart (Figure 19) are noticed immediately. Cows number approximately 1270 in region 9 and above 500 in region 5. Approximately 1000 pigs are reared in region 10 whereas close to 500 are reared in both region 5 and 9. The largest number of sheep (more than 2000) are in region 5, whereas more than 500 are in region 9 and very few can be found in region 10. Chickens are most abundant in region 10 reaching numbers above 14000 whereas the number reared in region 5 is approximately 6500 and the number in region 9 is approximately 2400. Finally, ducks are reared mainly in region 5 where the number of animals is approximately 5000.

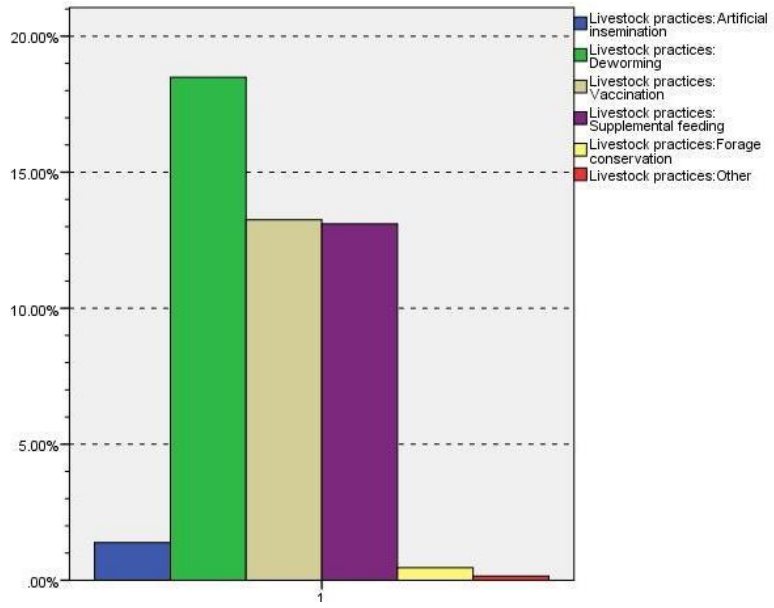

Figure 20 Livestock Practices

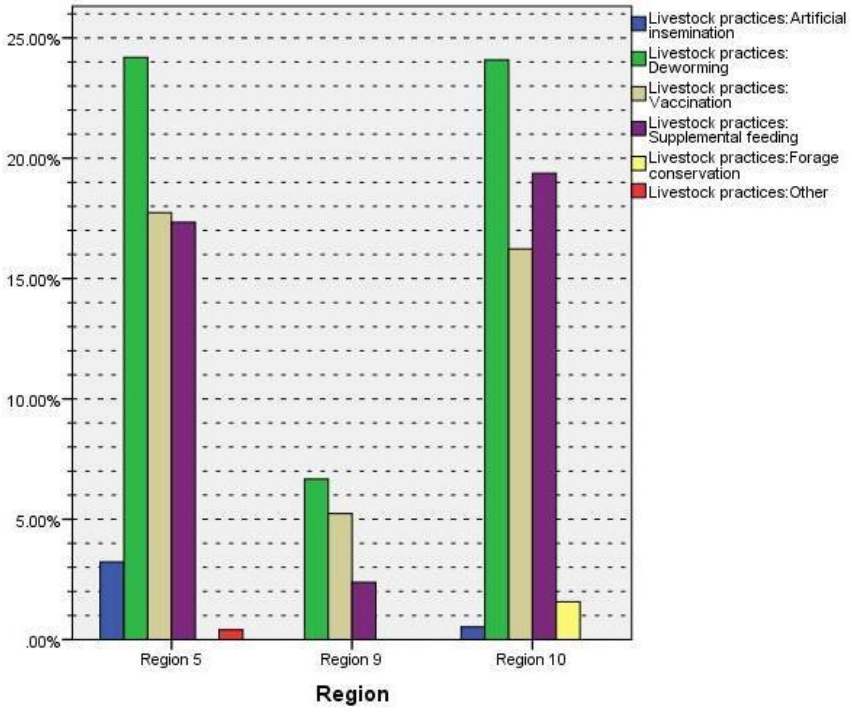

Figure 21 Livestock Practices by Region

Agricultural households engage in various practices in the rearing of the animals, but the prevalence of the practices is low in terms of the percentages of households that engage in them (Figure 20). Less than 20% of the households engage in any of the practices and less than 2% percent practice artificial insemination and forage conservation. The

most popular practice is deworming which is done my approximately 17.5% of the households and done mainly in regions 5 and 10 wherein it is done by approximately 24% of the households (Figure 21). Both vaccination and supplemental feeding are done by close to 13% of the households and are done mainly in regions 5 and 10. Forage conservation is done only in region 10 by approximately 2.5% of the households (Figure 21).

Aquaculture

Only three households overall reported that they were engaged in aquaculture and two of them are in region 9 while the other is in region 5 (Table 10). The region 5 household rears Nile tilapia and Hassar whereas one region 9 household rears Cutti and the other did not identify any particular type of fish (Table 11). The household in region 5 uses tanks or ponds for their fish as is done for cutti in region 9.

Table 10 Aquaculture Households

Region	Aquaculture production		Total
	Yes	No	
Region 5	1	331	332
Region 9	2	355	357
Region 10	0	222	222
Total	3	908	911

Table 11 Fish Type and Quantity by Region

Region	Fish Quantities		
	Nile Tilapia	Cutti	Hassar
Region 5	200		200
Region 9		1800	
Region 10			

Crops

Crops are viewed as either temporary or permanent are these two categories are handled separately.

Temporary Crops

Overall, approximately 75.41% of the agricultural households indicated that the produced temporary crops in the last twelve months (Figure 22). However, the percentage is larger for region 9 (86.27%) but smaller for regions 5 and 10 (67.77% and 69.37% respectively) (Figure 23).

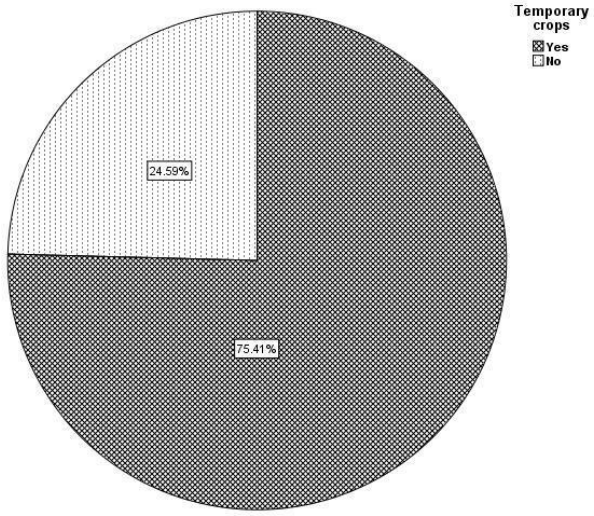

Figure 22 Households Producing Temporary Crops

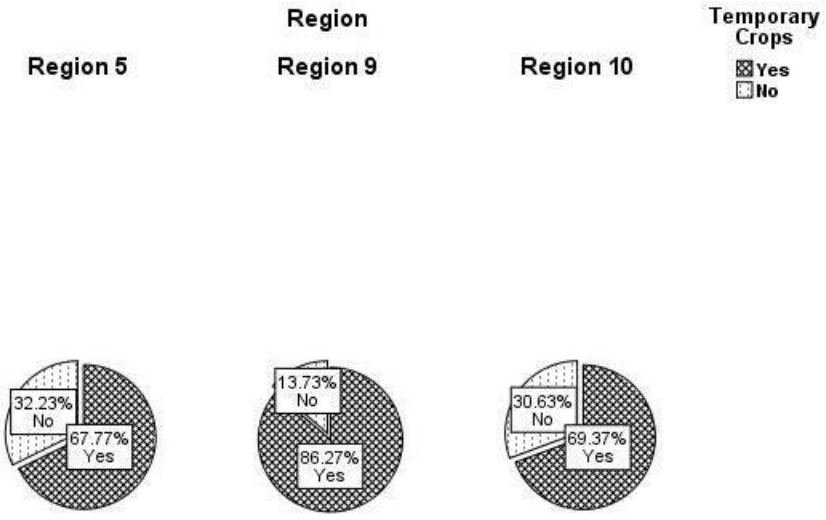

Figure 23 Households Producing Temporary Crops by Region

The most popular temporary crop produced (approximately 50% of the households) at the aggregate level is bitter cassava (Figure 24) due mainly to its dominance in region 9 were it is produced by nearly 88% of the households (Figure 25). This crop is grown mainly in the hinterland although approximately 29% of the farming households in region 10 also produce it (Figure 25). Next in line is bora which is produced mainly in regions 5 and 10 but more so in region 10 where is it produced by approximately 38% of the farming households there compared to approximately 19% in region 5. The third most popular crop is sweet cassava which is produced by approximately 13% of the farming households overall. However, this crop is produced by approximately 36% of the farming households in region 10 and by approximately 17% of those in region 5 but by only 6% of the farming households in region 9. No other temporary crop of the list of 43 potential temporary crops identified.

Between 5% and 10% of the farming households overall produced eggplant, callaloo, celery, corn, cucumber, eddoe, eschallot, ochre, pak choy, sweet pepper, hot pepper wiri wiri pepper, pineapple, pumpkin, rice, tomato, watermelon or some other crop as temporary crop. All other temporary crops are produced by at most 4% of the households.

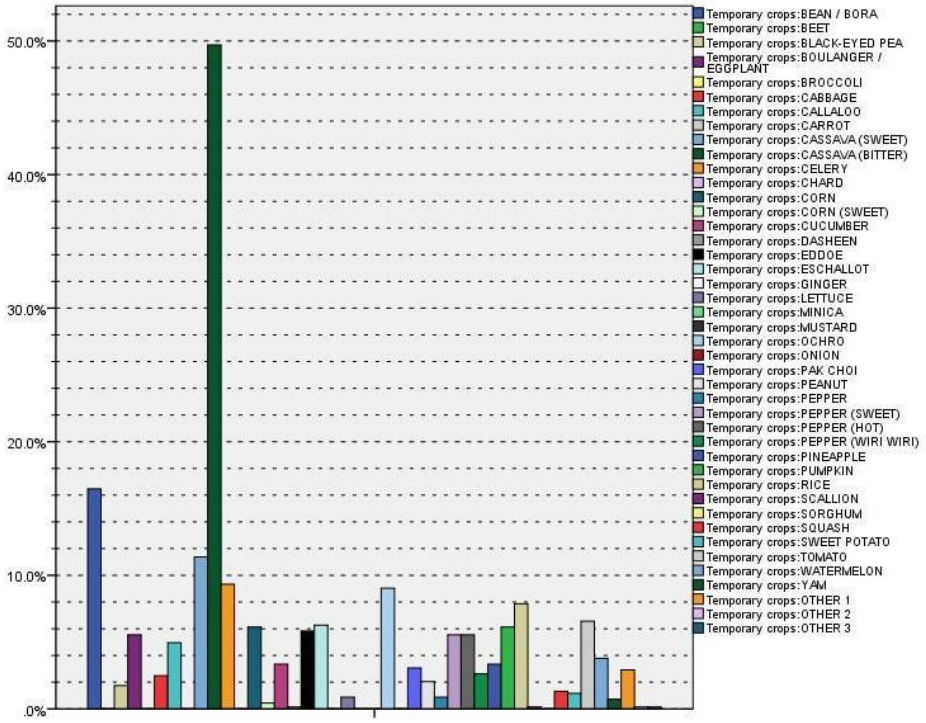

Figure 24 Temporary Crops Produced

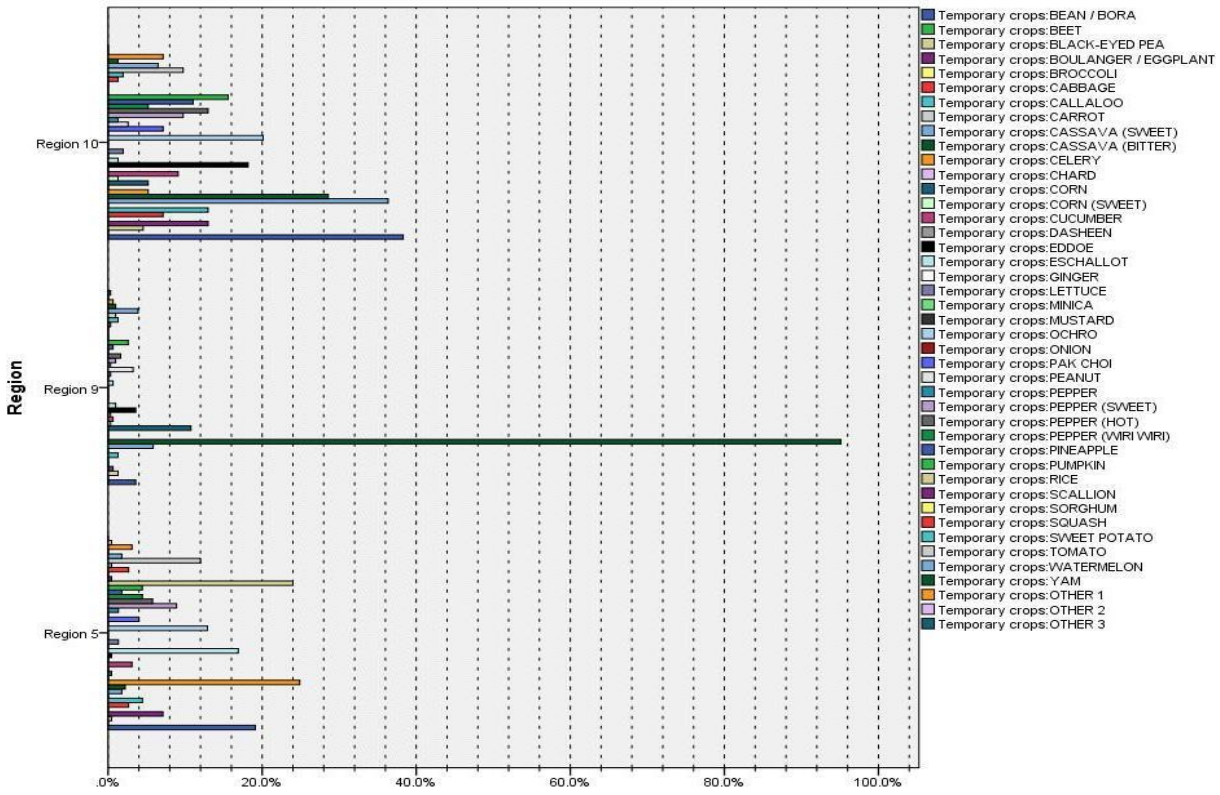

Figure 25 Temporary Crops by Region

Table 12 Number of Households Producing Other Temporary Crops

Other Temporary Crop	Region			Total
	Region 5	Region 9	Region 10	
Corilla	4		3	7
Plantain	1			1
Red beans	2		7	9
Same	1			1
Cucumber		1		1
Sugar cane		1		1
Tangerine		1		1
Sorrel			1	1

Apart from the list of 43 temporary crops that was presented, the households identified a few other temporary crops. These are shown in Table 12. A few households identified corolla and red beans but a few other temporary crops were each identified by a single households.

Table 13 Area Cultivated by Temporary Crops

Crop	Number of Households	Total Acres	Average Acres
Bean / Bora	94	73.033	0.78
Beet			
Black-Eyed Pea	9	26.001	2.89
Boulanger / Eggplant	31	6.966	0.22
Broccoli			
Cabbage	16	8.409	0.53
Callaloo	30	4.068	0.14
Carrot			
Cassava (Sweet)	69	20052.643	290.62
Cassava (Bitter)	321	566.850	1.77
Celery	53	2580.979	48.7
Chard			
Corn	29	34.510	1.19
Corn (Sweet)	2	2.002	1
Cucumber	20	8.464	0.42
Dasheen	0		
Eddoe	29	21.783	0.75
Eschallot	34	8.049	0.24
Ginger			
Lettuce	4	2.461	0.62
Minica			
Mustard			
Ochro	49	18.900	0.39
Onion			
Pak Choy	19	7.974	0.42
Peanut	13	25.480	1.96
Pepper	5	1.200	0.24
Pepper (Sweet)	29	8.155	0.28
Pepper (Hot)	32	8.087	0.25
Pepper (Wiri Wiri)	12	2.273	0.19
Pineapple	20	28.693	1.43
Pumpkin	31	22.548	0.73
Rice	54	1846.286	34.19
Scallion	1	0.001	0
Sorghum			
Squash	8	2.941	0.37
Sweet Potato	2	2.003	1
Tomato	37	12.253	0.33
Watermelon	19	121.057	6.37
Yam	3	100.260	33.42
Other 1	19	25.358	1.33
Other 2	1	0.004	0
Other 3			

* The estimates are based on what was reported. Don't know answers were deleted.

The households reported vast differences in the amounts of land cultivated by the temporary crops (see Table 13 and Table 14). The highlights of these results are sweet cassava which is cultivated on approximately 20052.63

acres with the vast majority of this cultivation in region 10; celery which is cultivated on approximately 2580.98 acres mainly in region 5; rice which is cultivated on approximately 1846.29 mainly in region 5. However, it is also seen that bitter cassava is cultivated on approximately 566.85 acres mainly in region 9. The other temporary crops that are grown are cultivated on much smaller scales.

Table 14 Area Cultivated by Temporary Crops by Region

Crop	Region 5			Region 9			Region 10		
	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre
Bean / Bora	35	12.065	0.34	2	0.33	0.16	53	60.09	1.13
Beet									
Black-Eyed Pea				2	1.50	0.75	7	24.48	3.50
Boulanger / Eggplant	13	3.290	0.25	1	0.50	0.5	17	3.10	0.18
Broccoli									
Cabbage	6	2.748	0.46				10	5.67	0.57
Callaloo	10	1.721	0.17	2	0.52	0.26	18	1.82	0.10
Carrot									
Cassava (Sweet)	4	1.269	0.32	13	11.00	0.85	52	20040.33	385.39
Cassava (Bitter)	5	11.336	2.27	278	509.68	1.83	38	46.70	1.23
Celery	47	2568.438	54.65				6	12.51	2.09
Chard									
Corn				24	21.60	0.9	5	13.00	2.60
Corn (Sweet)				1	2.00	2	1	0.00	0.00
Cucumber	7	3.001	0.43	1	0.18	0.18	12	5.29	0.44
Dasheen									
Eddoe	1	0.250	0.25	7	3.00	0.43	21	18.57	0.88
Eschallot	31	6.018	0.19	1	0.04	0.04	1	0.00	0.00
Ginger							1	2.00	2.00
Lettuce	2	2.260	1.13				2	0.20	0.10
Minica									
Mustard									
Ochro	22	5.332	0.24	2	0.30	0.15	25	13.35	0.53
Onion									
Pak Choy	9	3.061	0.34	1	0.25	0.25	9	4.64	0.52
Peanut				9	14.22	1.58	4	11.24	2.81
Pepper	3	0.720	0.24	1	0.25	0.25	1	0.25	0.25
Pepper (Sweet)	17	3.906	0.23	1	0.00	0	11	4.19	0.38
Pepper (Hot)	13	3.320	0.26	1	0.00	0	18	5.72	0.32
Pepper (Wiri Wiri)	8	2.262	0.28				4	0.01	0.00
Pineapple	3	3.750	1.25	1	0.25	0.25	16	24.60	1.54
Pumpkin	8	3.958	0.49	4	2.50	0.63	19	16.07	0.85
Rice	54	1846.286	34.19						
Scallion	1	0.001	0						
Sorghum									
Squash	6	1.950	0.33				2	1.00	0.50
Sweet Potato	1	0.003	0				1	2.00	2.00
Tomato	23	8.132	0.35				14	4.27	0.31
Watermelon	4	7.000	1.75	5	1.74	0.35	10	112.25	11.22
Yam				2	99.25	49.63	1	1.00	1.00
Other 1	7	3.318	0.47	1	1.00	1	11	21.01	1.91

Crop	Region 5			Region 9			Region 10		
	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre
Other 2	1	0.004	0						
Other 3									

n – number of households, Avg. – average. The estimates are based on what was reported. Don't know answers were deleted.

Permanent Crops

Turning attention to permanent crops, we notice that just approximately 17.34% of the households reaped them in the previous twelve months (Figure 26). Consistent with this are the small percentages per region engaged in producing permanent crops. These percentages are 8.13% in region 5, 14.57% in region 9 and 35.59% in region 10 (Figure 27). Permanent crops therefore seem to be most popular in region 10.

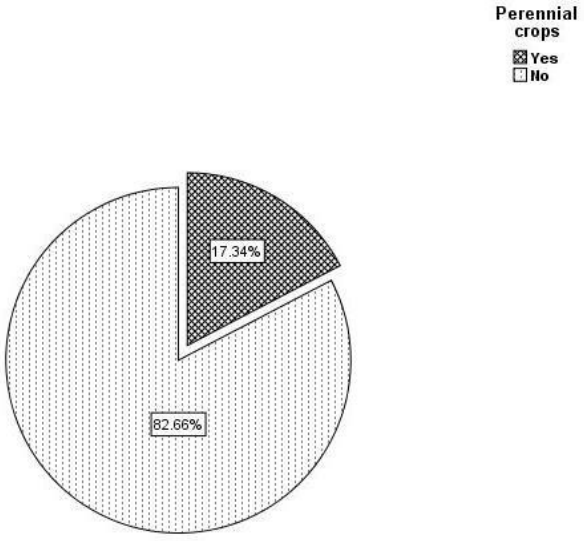

Figure 26 Households Producing Permanent Crops

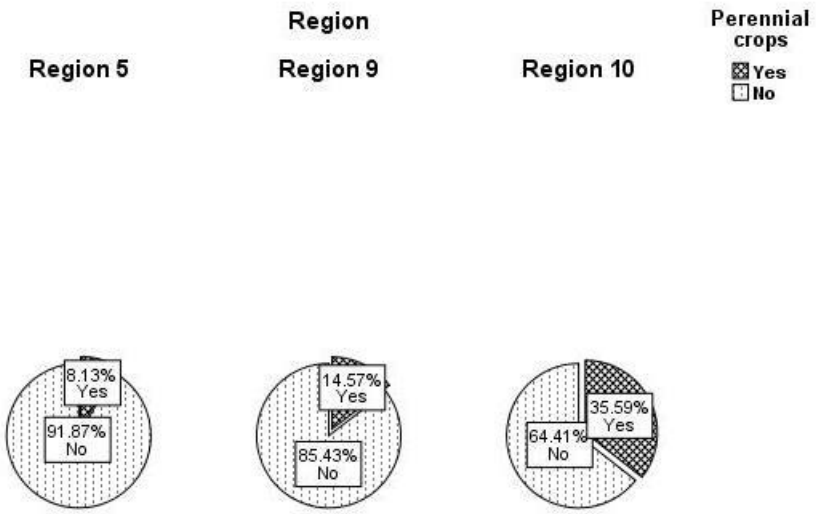

Figure 27 Households Producing Permanent Crops by Region

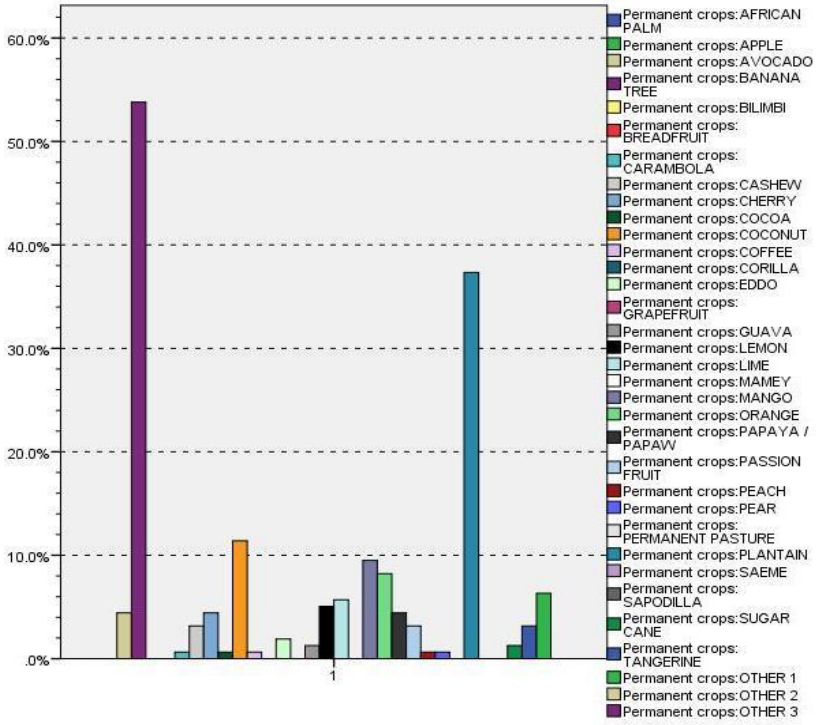

Figure 28 Permanent Crops Produced

The most popular permanent crops among the households that produced such crops are banana (approximately 58%) and plantain (approximately 44%) (Figure 28). Furthermore, banana is the most popular permanent crop in each region (Figure 29) in that it is produced by the largest percentage of households in regions 9 and 10 wherein it is produced by more than 54% of the households respectively and by the second largest percentage of households in region 5 wherein it is cultivated by approximately 45% of the farming households. Plantain is also popular in region 5 and 10 where it is cultivated by almost 56% and approximately 49% of the households respectively.

Coconut comes at a distant third position as it is produced by approximately 14% of the households overall. No other permanent crops are produced by as much as 10% of the households at the aggregate level, but mangoes (9%) and oranges (8%) are closest to 10% popularity at the aggregate level (Figure 28) and they exceed 12% in region 9 (Figure 29).

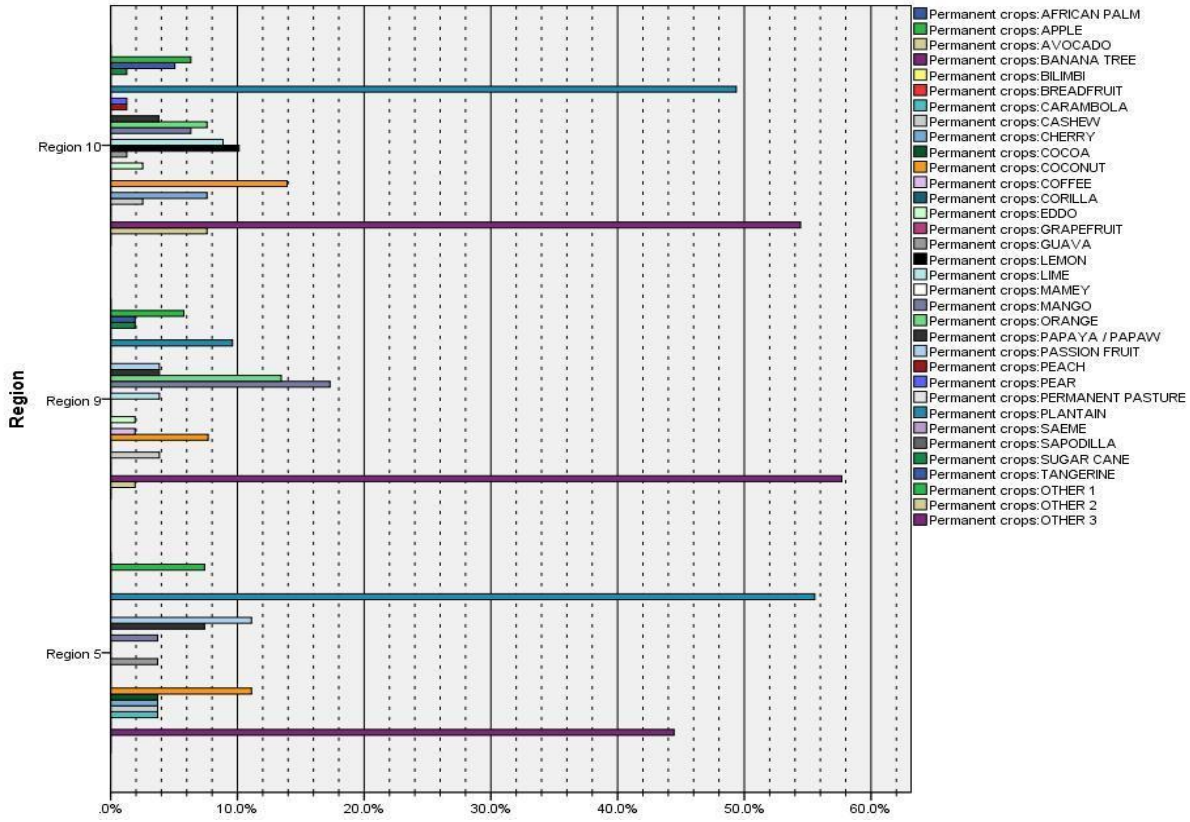

Figure 29 Permanent Crops Produced by Region

Some other permanent crops cited by the households are shown in Table 15. These are produced by small numbers of households overall.

Table 15 Number of Households Producing Other Permanent Crops

Other Permanent Crop	Region			Total
	Region 5	Region 9	Region 10	
Pigeon Peas	1			1
Soursop	1		1	2
Citrus		1		1
Pineapple		1	2	3
Paripee			1	1

Although it is produced by a small number of households, avocado appears to occupy the largest area of the permanent crops as it is cultivated on approximately 1503.52 acres of land based on the reports of the households (Table 16). This crop is grown almost exclusively by households in region 10 (Table 17). Next in line is plantain with 98.63 acres of which approximately 61.23 acres are in region 5 and 35.61 are in region 10. The amount of land cultivated by banana is not much lower (87.43 acres) and this is shared mainly between regions 9 and 10. The areas cultivated by other permanent crops are much smaller.

Table 16 Area Cultivated by Permanent Crops

Permanent Crop	Number of Households	Total Acres	Average Acres
African Palm			
Apple			
Avocado	5	1503.521	300.70
Banana Tree	71	87.426	1.23
Bilimbi			
Breadfruit			
Carambola	1	0.000	0.00
Cashew	5	1.509	0.30
Cherry	6	3.003	0.50
Cocoa	1	0.003	0.00
Coconut	14	40.819	2.92
Coffee			
Corilla			
Eddo	4	2.514	0.63
Grapefruit			
Guava	2	0.005	0.00
Lemon	7	12.256	1.75
Lime	7	11.881	1.70
Mamey			
Mango	1	7.000	7.00
Orange	31	7.588	0.24
Papaya / Papaw	4	3.241	0.81
Passion Fruit	3	0.407	0.14
Peach	1	1.500	1.50
Pear	1	10.000	10.00
Permanent Pasture			
Plantain	47	98.613	2.10
Saeme			
Sapodilla			
Sugar Cane	2	1.760	0.88
Tangerine	5	7.300	1.46
Other 1	5	2.009	0.40
Other 2			
Other 3			

Table 17 Area Cultivated by Permanent Crops by Region

Permanent Crops	Region 5			Region 9			Region 10		
	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre	n	Total Acre	Avg. Acre
African Palm									
Apple									
Avocado				1	0.500	0.50	4	1503.00	375.75
Banana Tree	9	5.60	0.62	26	35.100	1.35	36	44.27	1.23
Bilimbi									
Breadfruit									
Carambola	1	0.00	0.00						
Cashew	1	0.00	0.00	2	0.502	0.25	2	1.00	0.50
Cherry	1	0.50	0.50				5	2.50	0.50
Cocoa	1	0.29	0.29						
Coconut	3	21.21	7.07				11	19.61	1.78
Coffee									
Corilla									
Eddo				2	0.500	0.25	2	2.01	1.01
Grapefruit									
Guava	1	0.00	0.00				1	0.00	0.00
Lemon							7	12.26	1.75
Lime				1	0.500	0.50	6	11.35	1.89
Mamey									
Mango	1	7.00	7.00						
Orange				6	1.310	0.22	5	6.12	1.22
Papaya / Papaw	2	1.26	0.63				2	2.00	1.00
Passion Fruit	3	0.41	0.14						
Peach							1	1.50	1.50
Pear							1	10.00	10.00
Permanent Pasture									
Plantain	14	61.23	4.37	2	2.000	1.00	31	35.61	1.15
Saeme									
Sapodilla									
Sugar Cane				1	0.750	0.75	1	1.00	1.00
Tangerine				1	0.200	0.20	4	7.11	1.78
Other 1	2	0.01	0.00				2	2.00	1.00
Other 2									
Other 3									

Forestry Products

Overall, a small percentage of agricultural households have harvested forestry products within the pervious twelve months (Figure 30) and this has occurred almost exclusively in regions 9 and 10 (Figure 31).

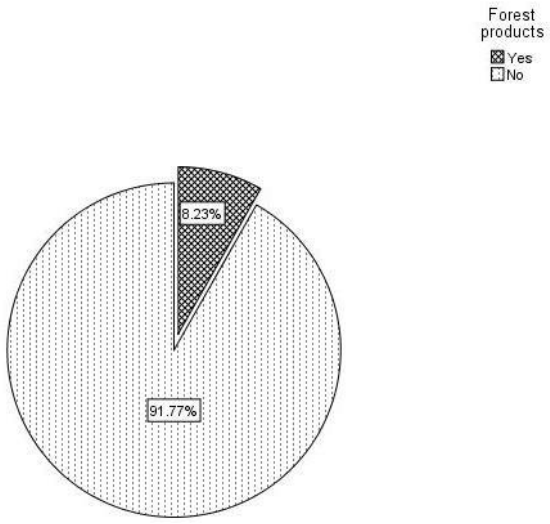

Figure 30 Household involved in Forestry Products

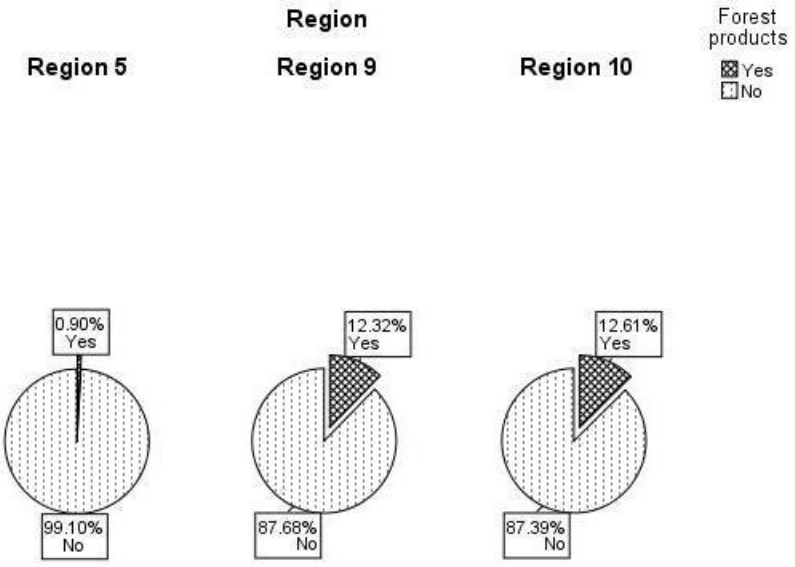

Figure 31 Harvesting Forestry Products

Those who harvested such products concentrated mostly on fish (Figure 32). In particular, approximately 56% of the households harvested fish from the forests at the aggregate level and harvesting fish was cited most often in each region (Figure 33). The second most popular item is handicraft products which were harvested by approximately 29% of the households. However, approximately, 46% of the households that harvested forestry products in region 9

reported harvesting handicraft products whereas less than 4% did so in region 10 and approximately 33% did so in region 5.

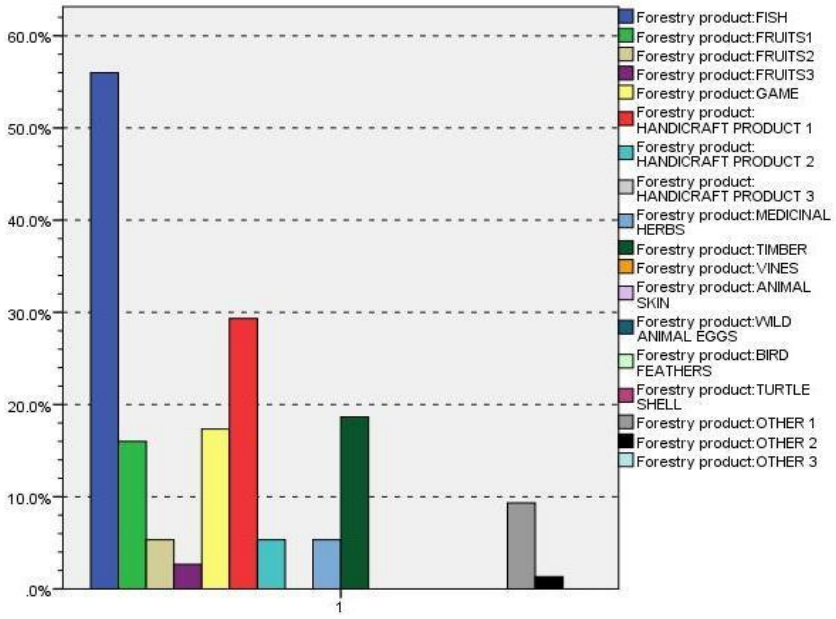

Figure 32 Type of Forestry Product

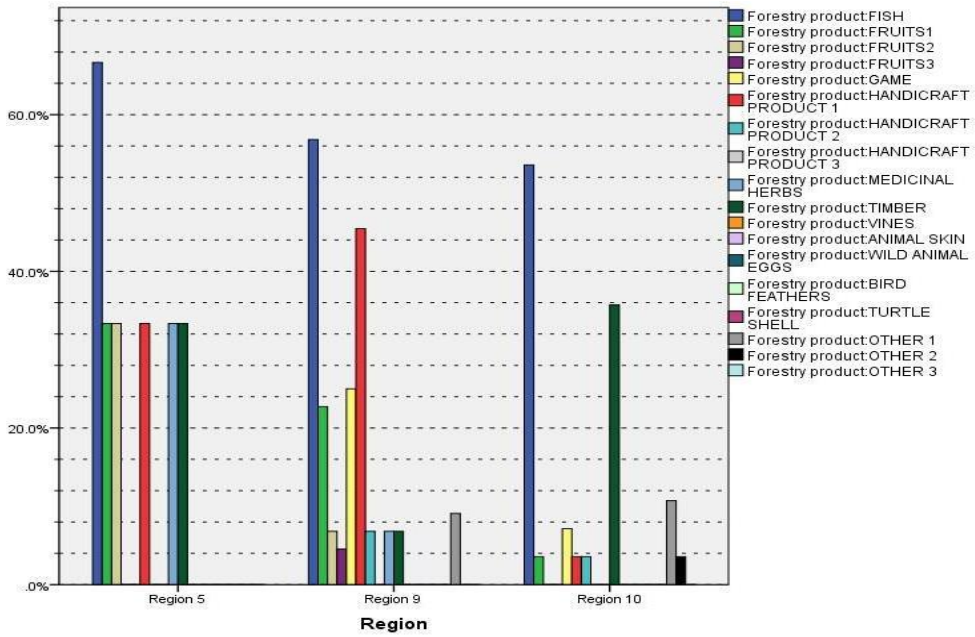

Figure 33 Forestry Products by Region

Harvesting of all other forestry products was done by less than 20% of the households and among the remaining item fruits (16%), game (17%) and timber (18%) are the only ones that were done by more than 10% of the households (Figure 32). The harvesting of fruits was done more often in regions 5 and 9 whereas harvesting game was done by larger percentages of the households in region 5 and 10.

Table 18 Fruits and Handicraft Items Harvested

Forestry Products	Region5	Region 9	Region 10
Forest Fruit 1			
Ite	1	3	
Brazilian Nuts		4	
Awara			
Kokrite		1	
Wild Cashew		1	
Coconut			1
Forest Fruit 2			
Kokrite	1	2	
Ite		1	
Forest Fruit 3			
Plum		1	
Turu		1	
Other Handicraft Product 1			
Nibi	1	4	
Balata		1	
Basketry		3	
Matapee		1	1
Mukuru		10	
Warishi		2	
Other Handicraft Product 2			
Caramani Wax		1	
Mukuru		1	
Sieveter		1	
Sifter			1
Other Forestry Product 1			
Insence		3	
Mukuru		1	
Birds			1
Snakes			1
Wild Meat			1
Other Forestry Product 2			
Birds			1

The households elaborated on some of the items harvested from the forest. These are shown in Table 18. It shows that many different fruits were harvested even though this was done by few households. It also shows the purposes for which handicraft items were harvested.

Assistance

Few households in the regions surveyed received assistance with their agricultural ventures in the previous year (Figure 34). This is a consistent trend across the three regions (Figure 35). However, those who received some assistance received it mainly in relation to crop farming in regions 5 and 9 and in relation to livestock production in region 10 (Figure 36).

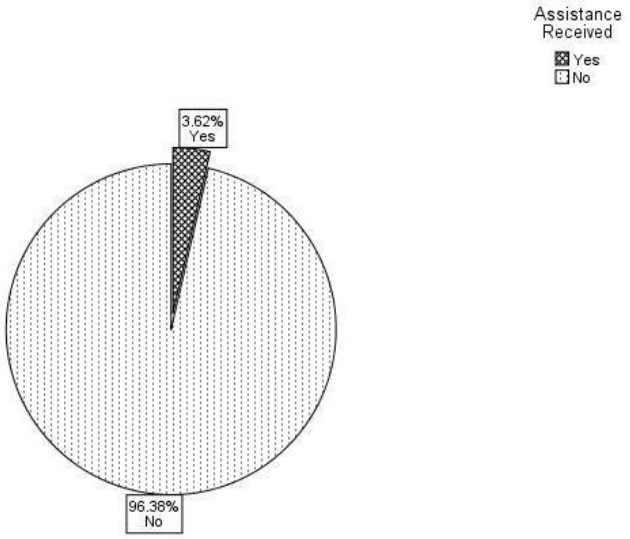

Figure 34 Assistance Received in the Last Year

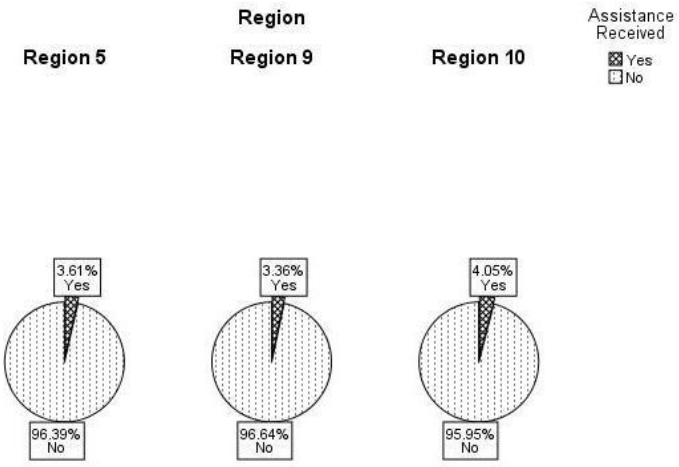

Figure 35 Assistance Received by Region

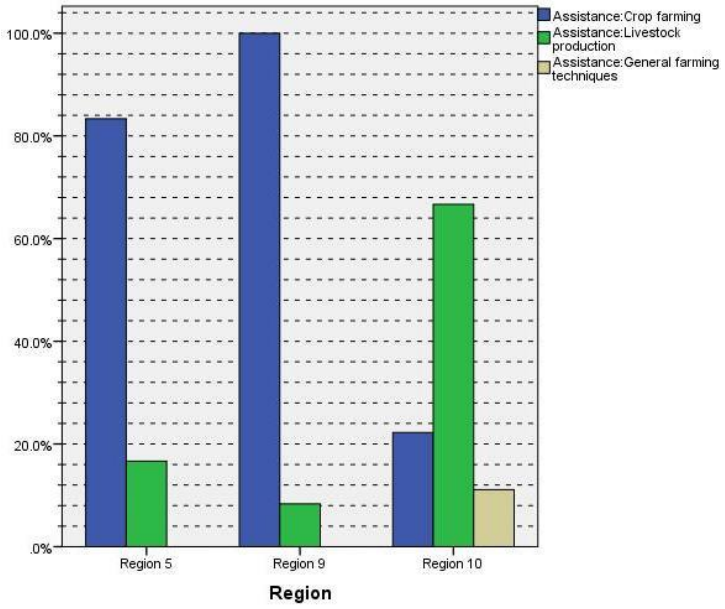

Figure 36 Area of Assistance Received

The vast majority of the agricultural households are interested in receiving assistance with their ventures (Figure 37). This is also a consistent trend across the regions surveyed (Figure 38).

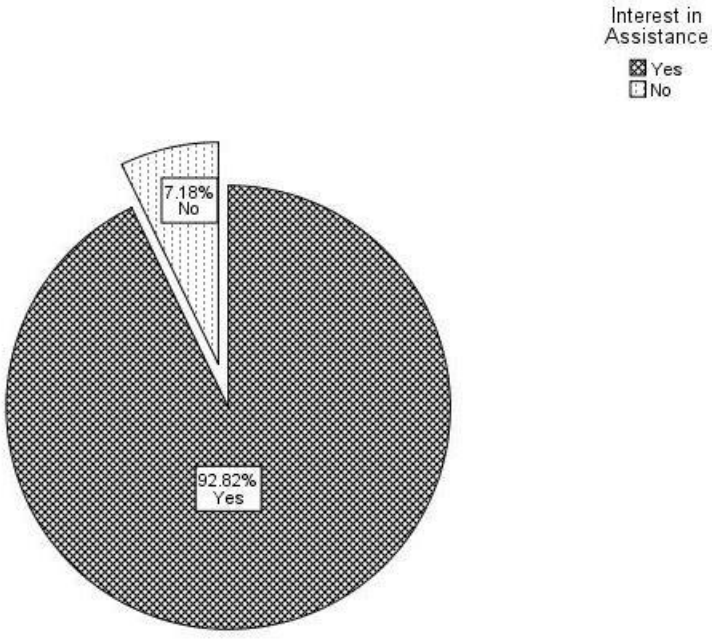

Figure 37 Interest in Receiving Assistance

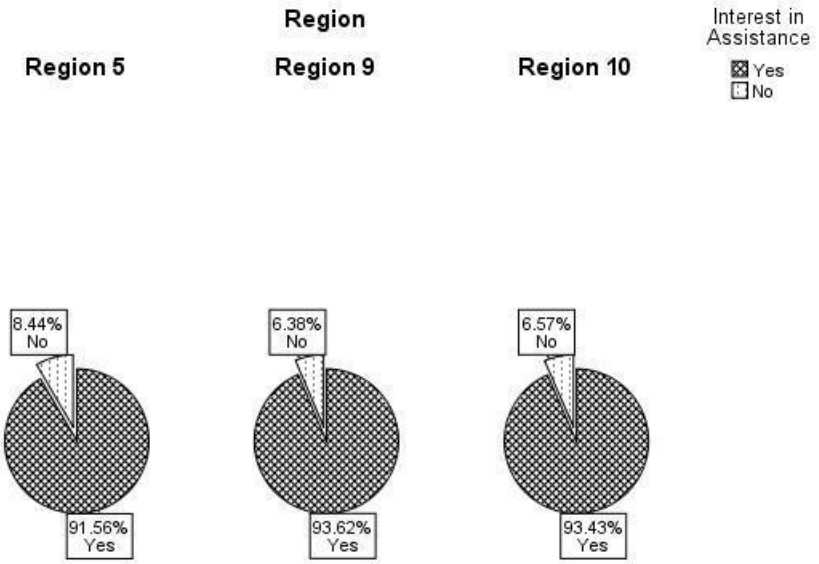

Figure 38 Interest in Assistance by Region

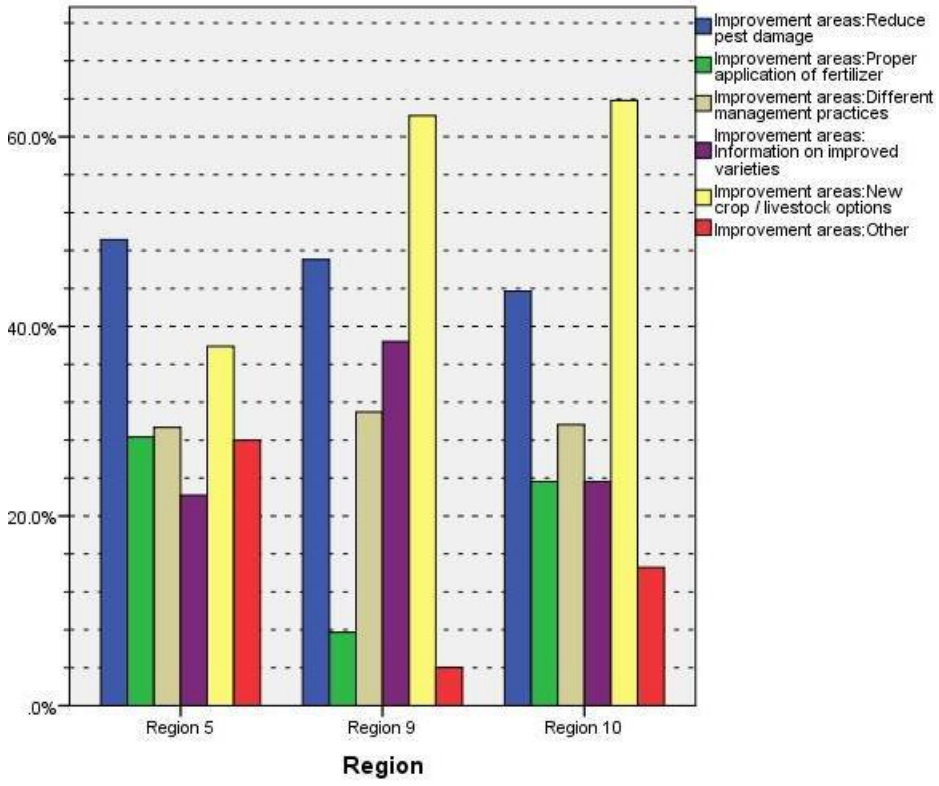

Figure 39 Assistance Areas of Interest

Most of the households (more than 60%) in regions 9 and 10 are interested in assistance in new crop/livestock options whereas just approximately 18% of the households in region 5 are interested in this (Figure 39). There is a somewhat steady trend across the regions of interest in reducing pest damage. In particular, between approximately 44% (region 10) and 49% (region 5) of the households per region selected reduce pest damage. Steadier still though of lower percentage (between 28 and 31%) is the trend in interest in different management practices. Information on improved varieties is of greatest interest in region 9 where approximately 38% of the households have selected this option. Finally, there appears to be low level of interest in the area of proper application of fertilizer in region 9 (less than 8%) but the levels are higher in regions 5 and 10.

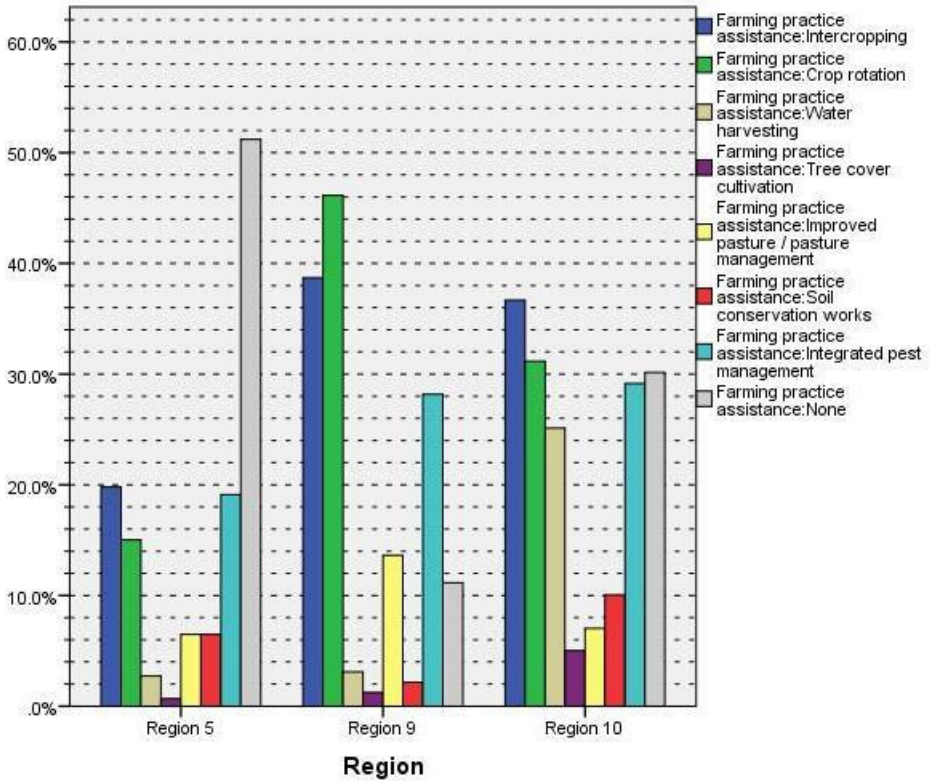

Figure 40 Interest in Assistance with Farming Practices

The level of interest in assistance in the various farming practices is generally low in region 5 where none of them have been selected by more than 20% of the households (Figure 40). In fact, a majority of the households have explicitly indicated a lack of interest in assistance in these areas. The situation is a bit different in regions 9 and 10 were there are higher rates of selection of intercropping, crop rotation and integrated pest management. In addition to this, approximately 25% of the households in region 10 are interested in receiving assistance with water harvesting.

Annex: Terms of Reference (TOR)

Support of Sustainable Agricultural Development Program (GY-L1060)

Baseline farm survey to support the Design of Loan GYL1060 (ATN/OC-15585-GY)

1. Background

The Government of Guyana (GoG) requested IDB funding for a loan operation for the agricultural sector. The "Sustainable Agriculture Development Program" (GY-L1060) will focus its activities in Region 9 and Region 10. Its objective is to increase the productivity of the agricultural sector while maintaining a sustainable and climate resilient use of natural resources in Guyana. Higher productivity will also reduce pressure on forest and fragile ecosystems and, at the same time, increase incomes for small- and medium-sized farmers. At the same time, the Program will support the implementation of Guyana's Climate Resilience Strategy and Adaptation Plan (CRSAP).

2. The preliminary design of the loan is based on three components:

a) **Strengthening of the agricultural innovation and extension system**. The loan will finance the implementation of a comprehensive strategy for innovation, extension and management of natural resources in the country. Agriculture centers will be established / improved, to contribute to local and regional development, including technology transfer, demonstration and training. This includes support to strategic innovation by funding adaptive agricultural innovation projects, with an emphasis on validation of technologies and their transfer to farmers. Two research centers have been identified by the MoA: Lethem / Manari (Region 9) and Ebini (Region 10). In both sites, infrastructure, equipment and innovation programs will be designed and implemented. Research / demonstration programs, identified through a prioritization exercise, will be implemented in collaboration with national and international research and technology transfer centers. These programs will identify specific beneficiary groups, technology transfer and monitoring and evaluation mechanisms, and deliver technology products as expected results. Agriculture Centers will also support activities in other regions of the country. Part of the Agriculture Center activities will focus on reducing vulnerability to climate change through multiplication and conservation of genetic material, including drought resistant varieties;

b) **Information for policy making and natural resource management**. This component will include the review and design of an Agricultural Information System (AIS), including the preparation and implementation of an Agricultural Census; a LIDAR survey of the North Rupununi (Region 9) and Region 10; strengthening of the Monitoring and Evaluation capabilities of the MoA; identification of buffer zones for sensitive wetlands (with potential to designate a RAMSAR site) in Region 9; and identification of potential water catchment sites for improved agricultural production and climate change adaptation in Region 9;

c) **Strengthening the Sanitary and Phytosanitary System, including food safety**. This will include the review and update of standards and codes related to products destined for export markets as well as local markets, both current and potential. During the design, specific markets and products will be analyzed to facilitate compliance with local and international regulations, especially related to the pilot facilities to be supported by the Program. Studies to support the implementation of pilot facilities for meat processing (Region 9 and Region 5) and milk processing will be prepared during the design.

3. The Program will be financed as an investment loan, up to 15 million USD. It is expected that the implementation period will be six years. The Program has been prioritized by the Government and included in the CPD 2016. The loan proposal will be submitted to the Board by December 2016.
4. This consultancy is part of the feasibility and technical studies needed for IDB Board approval.

Consultancy objective

5. The objective of this consultancy is to develop a microeconomic database of farms and farming households in Regions 5, 9 and 10. This database will enable statistical and econometric analysis to evaluate the ex-ante economic impact of the investment program and serve as the program baseline for the expost economic impact evaluation. The database will be established through field surveys of approximately 897 farms and farming households and will include beneficiaries and non-beneficiaries of the investment program.

Main activities

6. The individual contractual will be responsible of carrying out, but not limited to, the following activities:

a. Sampling frame and strategy. The contractual will review sample size and strategy provided by the Bank and the MoA[2]. The number of sampled farming households and farms should be corroborated by the contractual. The strategy will also detail how non-responses and households who are unavailable at the time of visit will be handed. The main variable of interest is productivity (Gross Value of Production per hectare, per year, in USD). Sample size should be adjusted by the standard deviation available for this variable, results from other studies, like SOFA 2015, can be used to approximate the sample size.
b. Development of survey instrument. Based on the survey templates supplied by the IDB, the contractual will work closely with the IDB to refine and finalize the survey instrument. Variables of interest include sociodemographic information, education, occupation, income/expenditure and other details of the household economy, access, characteristics of land holding, yields, type of farming system, crops, inputs, outputs, and market access among others. Guidance on minimum dataset requirements are outlined in Herrero et al (2007).[3]
c. Training and capacity building. The contractual will be responsible for organizing a survey team and will provide the necessary training to the field enumerators, observers, supervisors and data entry technicians. The contractual is responsible for ensuring that the team has all the training and equipment it requires to perform its field work to the highest standard in quality. Enumerators should preferably have at least one

[2] The Ministry of Agriculture reports 505 permanent, cash crop and livestock farmers in Region 10. A representative sample of this number of farms would be 219 given 95% confidence and 5% margin of error.

[3] Herrero, M., González-Estrada, E., Thornton, P. K., Quirós, C., Waithaka, M. M., Ruiz, R., & Hoogenboom, G. (2007). IMPACT: Generic household-level databases and diagnostics tools for integrated crop-livestock systems analysis. Agricultural Systems, 92(1–3), 240-265. doi: http://dx.doi.org/10.1016/j.agsy.2006.03.008

year prior experience with implementing surveys. An enumerator manual will be produced describing and explaining each question in the survey.

d. Sensitization of population. A sensitization campaign in the communities will be undertaken to alert farming households and farmers that a survey will be undertaken in the area.
e. Survey pilot. The contractual will undertake a pilot of the survey instrument to a group of 60 farming households and farms to enable the evaluation of the survey instrument in terms of its comprehensiveness, flow and other aspects of operationalization, relevance and the quality of data that arises from the survey. A survey pilot report will be prepared describing the experience of the pilot and any recommendations to revise the survey instrument. Based on the IDB's analysis of the report, the survey instrument will be revised in close consultation with the IDB.
f. Work planning. The contractual will develop a work plan, subject to IDB review and prior approval, which details the following: (i) sample frame and sampling strategy, including spatial details of strategy (e.g. how will farming households and farms be identified in the field); (ii) logistics for implementing fieldwork including supervision, quality control and double data entry protocols; (iii) sensitization campaign; (iii) collaboration strategy with relevant government bodies and the IDB; (iv) best practice plan for handling ethics issues in survey research, including anonymity and confidentiality; (iv) detailed budget and timeline.
g. Fieldwork. The contractual will undertake the survey in the field, surveying at least 897 households in Regions 5, 9 and 10. Geographic coordinates of each sampled unit will be taken in the field. Any proposed changes to the survey instrument must have approval by the IDB. The enumerators undertaking this fieldwork should be the same ones that participated in the training and survey pilot. Any deviation from this should be reported to the IDB for prior approval.
h. Data entry. Double data entry will be conducted on a daily basis with results sent to the IDB every 2 days for ongoing monitoring of field operations. Data sets will be forwarded to the IDB regularly for review in Stata format.
i. Data cleaning, summary statistics and delivery. The database will be cleaned, summary statistics will be generated, and the database will be delivered to the IDB for approval.
j. Final reporting. A final report will be prepared which includes details of methodology, the survey and the survey pilot, details of field implementation and logistics, and summary statistics and analysis based on the final database.

Reports / Deliverables

7. All products, reports, documents, computer code/models resulting from this consultancy will be property of the IDB. Standard bibliographic practices for the attribution of information to its sources should be observed. The IDB reserves the right to publish final reports, under its own name on its website or in print, with or without changes to the content of the document presented by the contractual.

8. The contractual will produce the following:

    a) Work plan and methods report. July 15,2016
    b) Draft survey instrument, enumerator manual, and sample size. July 18.
    c) Survey pilot report, including pilot database. July 20
    d) Final survey instrument. July 20
    e) Database. The database will contain the cleaned data obtained through the implementation of the survey. August 12

f) Final report. The report will include details of methodology, the survey and the survey pilot, details of field implementation and logistics, and summary statistics and analysis based on the final database. August 15

g) Completed surveys. The completed surveys will be returned to the IDB.

9. The dates established for product delivery can be modified prior justification and acceptance by CI-Guyana.

Annex: Sample Selection

SAMPLE FOR REGION 5
Sample stratification: village

Total number of households: 330
Number of villages in sample: 46 (of 175)
Source: Agricultural Census 2002 (Bureau of Statistics)

Village Code	Village	Total Agri HHs	Sampled HHs
01	Airy	32	5
02	Balthyack or No. 8	71	5
03	Balthyack or No. 9	63	5
04	Bara-Bara	27	5
05	Belladrum	18	5
06	Blairmont or No. 7	72	5
07	Blenheim	19	5
08	Bush Lot	322	25
09	Bush Lot or No. 3	163	10
10	Calcutta	54	5
11	Chester	17	5
12	Cotton Tree	323	25
13	D'Edward	170	10
14	Dundee	48	5
15	Edderton	36	5
16	Eldorado	14	5
17	Experiment	38	5
18	Foulis	27	5
19	Glaziers Lust	6	5
20	Golden Fleece	34	5
21	Governor Light	6	5
22	Grant 3530 and Grant 1854	99	5
23	Hope	44	5
24	Huntley	14	5
25	Lichfield	17	5
26	Little Biabu or No. 10	81	5
27	Mon Choisi	82	10
28	No. 12 Village	39	5
29	Novar	59	5

30	Paradise	14	5
31	Pine Ground or Grant 3269	35	5
32	Regenbach	14	5
33	Rosignol	157	10
34	Seafield	37	5
35	St. Francis Village	152	10
36	Tempe	29	5
37	Union	29	5
38	Water Dog, Mora Point or Grant 3272	23	5
39	Waterloo	447	30
40	Waterloo Jib	73	5
41	Woodley Park	215	15
42	Wyngaarts Lust	29	5
43	Zee Lust	38	5
44	Zee Zight	90	5
45	Zes Kinderen	21	5
46	Zorg en Hoop	77	5
Total		**3475**	**330**

SAMPLE FOR REGION 9

Stratification: By village

Number of villages in sample: 45 (of 56)

Source: RDC (2015)

Village Code	Villages	Total HHs	Sampled HHs
47	Achiwib	103	15
48	Aishalton	170	20
49	Annai	76	5
50	Aranaputa	94	10
51	Awarewaunau	90	5
52	Baitoon	47	5
53	Churikadarnau	15	5
54	Crashwater	38	5
55	Fly Hill	33	5
56	Hiowa	46	5
57	Kaicumbay	33	5
58	Karasabai	192	15
59	Karaudarnau	176	15
60	Katoka	133	15

61	Katoonarib	67	5
62	Katuur	29	5
63	Kumu	63	5
64	Kwatamang	68	5
65	Massara	73	10
66	Moco Moco	76	10
67	Mururanau	138	10
68	Nappi	109	10
69	Pai Pang	30	5
70	Parikwarwaunau	35	5
71	Parishara	78	5
72	Potarinau	104	10
73	Quarrie	33	5
74	Quatata	46	5
75	Quiko	46	5
76	Rukumuta	43	5
77	Rupetee	57	5
78	Rupunau	51	5
79	Sand Creek	139	15
80	Sawariwau	104	10
81	Semonie *	49	5
82	Shea	62	5
83	Shulinab	75	5
84	St. Ignatius *	168	15
85	Surama	49	5
86	Tiger Pond	59	5
87	Toka	35	5
88	Wowetta	53	5
89	Yakarinta	96	10
90	Yupukari	142	10
91	Yurong Paru	57	10
Total		**3,479**	**350**

* Village population is smaller than number of sampled households; interview households from neighboring villages to fill sample quota

SAMPLE FOR REGION 10

Sample stratification: type of farmer (individual or Amerindian) and village

Total number of households: 219

1. INDIVIDUAL FARMERS

Total number of households: 165

Number of villages in sample: 25 (of 108)

Source: Agricultural Census 2002 (Bureau of Statistics)

Village Code	Village	Total Agri HHs	Sampled HHs
92	Amelia's Ward	93	5
93	Canvas City (Half Mile)	27	5
94	Christianburg	39	5
95	Cockatara (North McKenzie)	10	5
96	Danjou Park	27	5
97	De Endragt *	2	5
98	De Velde	49	5
99	Fort Nassau	40	10
100	Gold Hill, Karahora Creek	6	5
101	Half Mile	18	5
102	Hibibia Creek, Muritaro	14	5
103	Hururu	33	5
104	Ituni	144	10
105	Kaboyari Creek	38	5
106	Kwakwani	136	10
107	Mabura Hill	185	15

2. AMERINDIAN SETTLEMENTS

Total number of households: 54

Number of Amerindian settlements in sample: 4 (of 7)

Source: Ministry of Indigenous People's Affairs (Year?)

Village Code	Settlement	Total HHs	Sampled HHs
118	Kimbia	56	11
119	Malali	74	15
120	Muritaro	76	15
121	Rockstone	67	13
Total		**273**	**54**

* Village population is smaller than number of sampled households;
interview households from neighboring villages to fill sample quota

108	Maria *	3	5
109	Mariabba Creek, Dehalibanna River	57	5
110	Rainbow City *	2	5
111	Richmond Hill, Watooka, Bauxite Plant *	2	5
112	Rosenburg *	2	5
113	Silver City	106	10
114	Wikki Settlement	6	5
115	Wismar	70	5
116	Wisroc (Block 22)	75	10
117	Zeelandia	5	5
Total		**1189**	**165**