# Livestock Ownership and Livelihood in the Northern Communal Areas:

# Using a randomised control trial to determine the impact of best practise and joint herding on farmers in Northern Namibia

**Findings from the Baseline Household Survey**

Prepared by:

Innovations for Poverty Action

April 5, 2012

Project funded by:

The Millennium Challenge Account Namibia & The Millennium Challenge Corporation

**CONTACT DETAILS OF EVALUATOR AND KEY PROJECT STAFF**

**Innovations for Poverty Action (IPA)**
101 Whitney Ave.
New Haven, CT 06510
USA
(+1) 203 772 2216

**Primary Investigators:**
Dean Karlan, Innovations for Poverty Action and Yale University
dean.karlan@yale.edu

Julian Jamison, Federal Reserve Bank of Boston
julison@gmail.com

**Deputy Executive Director, Research and Policy:**
Delia Welsh
dwelsh@poverty-action.org

**Project Director:**
Luke Crowley
lcrowley@poverty-action.org

**Postdoctoral Associate:**
Alvin Etang, Yale University
alvin.ndip@yale.edu

**Project Associate:**
Elizabeth Ludwig
eludwig@poverty-action.org

# LIST OF ACRONYMS AND ABBREVIATIONS

MCC  Millennium Challenge Corporation
MCA-N  Millennium Challenge Account Namibia
CBRLM  Community Based Rangeland and Livestock Management
GOPA  GOPA Consortium
MDE  Minimum Detectable Effect
NORC  National Opinion Research Centre
SW  Survey Warehouse
GA  Grazing Area
RIA  Rangeland Intervention Area
IPA  Innovations for Poverty Action
LSM  Living Standard Measure
PA  Project Associate
PI  Primary Investigator
RCT  Randomised Controlled Trial
NCA  Northern Communal Area
NHIES  Namibian Household Income and Expenditure Survey

# CONTENTS

# TABLE OF FIGURES

# 1. EXECUTIVE SUMMARY

As a growing population and adverse grazing practices threaten the quantity and quality of the rangeland in Northern Namibia, the Millennium Challenge Account Namibia (MCA-N), in collaboration with the Millennium Challenge Corporation (MCC) and GOPA, has sought a proactive solution to both the degradation of the rangeland and the poverty facing farmers in the Northern Communal Areas (NCAs) of Namibia. In July of 2008, the Republic of Namibia and the Government of the United States of America through MCC signed the MCA-N Compact to provide grant funding for public investments in Education, Tourism, and Agriculture. MCA-N's Community Based Rangeland and Livestock Management (CBRLM) programme is part of a larger set of interventions in the Agriculture sector aimed at reducing poverty in the NCAs. The CBRLM sub-activity seeks to engage farmers in communal herding and animal husbandry best practices to improve the health of the grassland, the quality of the livestock, and the income of households through increased market access.

The pilot programme includes an independent assessment conducted by Innovations for Poverty Action (IPA) to test the impact of the various activities within the CBRLM intervention on household income, cattle productivity, and rangeland condition. The aim of this evaluation is to assess the effectiveness of the CBRLM programme in the hopes of refining a successful programme that can then be adopted and scaled up at the end of the Compact. The impact analysis will be carried out using data from three sources: a household income and expenditure survey, a cattle assessment, and a rangeland assessment. This report focuses on the findings from the household income baseline survey.

The CBRLM Household Income and Expenditure Survey will be used to test for differences across a range of outcome measures between households located in pre-defined CBRLM intervention areas and households located in pre-defined CBRLM *non-*intervention areas. In addition to assessing the impact of the CBRLM programme over the course of the Compact, the CBRLM Household Income and Expenditures Survey can also offer information on the welfare and practices of farming households in the study area at the outset of programme implementation.

To rigorously measure the impact of the intervention, we employ a randomised controlled trial (RCT) methodology. Random assignment to intervention and *non-*intervention groups ensures that the groups are statistically identical on all factors except the assignment to the intervention group and thus any change seen at the end of the intervention can be directly attributed to the effects of the programme and not some other confounding factor.

Findings from the baseline household survey paint a picture of a set of communities that fall well below the average income of households in their respective regions in Namibia. These households appear to subsist through the production of crops and the use and care of livestock. Though the questionnaire design and definition of the household may undercount income and expenditure flows, livestock holdings are shown to contribute minimally to household income. Low market offtake means that households which are "wealthy" in terms of animal holdings may not be relatively wealthy in monetary terms. Low sales are driven by low market access coupled with unwillingness to sell. Farmers appear to sell primarily when there is a large household payment to be made (school fees, funeral, etc). While crops and animal by-products such as dairy fat are a key supplement to household consumption, income in the form of money comes primarily from household members working outside the home, remittances, and small business ownership. However, with improved knowledge of and access to savings mechanisms, greater market access, and improved information on business methods, household income could be raised through more business oriented livestock ownership practices.

The CBRLM programme builds its foundation on the concepts of community cooperation and the joint management of a common resource. Therefore, the baseline data includes measures of social cohesion from both field experiments as well as survey questions. These measures will enable the research team to examine whether the CBRLM programme works better in households (and villages) with certain levels of trust, social cohesion, and participation. This is an important consideration for policy-makers, both in Namibia and abroad. The large sample size of the behavioural field experiments and involvement of the village head in the activities make this a unique dataset.

In 2014, the baseline data will be combined with endline date to estimate treatment effects of the CBRLM programme through intent to treat (ITT) and treatment on the treated (TOT) analysis (explained in more detail in Section 5.4 'Analysis'). Specifically, we will regress key outcome variables -- such as income and offtake rates -- on an indicator variable for those households in intervention RIAs. In addition to these main effects, the evaluation team will look for evidence of heterogeneous treatment effects – such as the effect of the CBRLM programme on female headed households, households with different herd sizes, and households with various levels of social capital. This level of analysis should offer deeper insight into how and why the CBRLM programme impacts the target population.

# 2. BACKGROUND AND OVERVIEW

## 2.1 Project Background

The CBRLM intervention is a pilot programme that targets communities in the Northern Communal Areas (NCAs) of Namibia with the intent to reverse the degradation of the communal grazing areas and improve incomes for rural farmers through better livestock management practices.

The NCAs face a "tragedy of the commons problem": a dilemma where individual actors consuming a resource according to their own interest, ultimately deplete the resource and create a sub-optimal outcome for all involved. As both the human and animal populations increase and herds graze freely on the rangeland, the grass availability reaches critical levels. A large component of the CBRLM intervention requires farmers to work together to develop land use and grazing plans, ultimately grazing their animals as part of a larger herd and increasing offtake when it is optimal for the health of the rangeland and the benefit of the group. It is hypothesized that these activities benefit from high levels of trust and cooperation between individuals in a community, and possibly between communities as well. Therefore, a portion of the Household Income Survey is dedicated to measuring these traits through behavioural activities and questions on social preferences.

The CBRLM intervention spans the 6 regions of Northern Namiba: Kunene, Omusati, Oshana, Ohangwena, Oshikoto, and Kavango with a population of 1.2 million persons primarily reliant on livestock farming for their livelihoods.

The intervention focuses on a series of programmes to improve rangeland and livestock productivity including: <u>rangeland management</u>, whereby farmers will group herds and coordinate their size and movement relative to the available resources; <u>animal husbandry training</u> to educate farmers on best practices in health, nutrition, offtake, and breeding; <u>livestock marketing and business development</u> designed to emphasize offtake, farm accounting, market prices, and other business related skills; <u>infrastructure support</u>, which will identify necessary small scale infrastructure improvements, such as upgrading water points and building crush pens; and a <u>community based zoning plan,</u> which will allocate land within the larger Rangeland Intervention Area (RIA) or regional area to various uses including tourism, cropping, livestock, etc.

## 2.2    *Purpose and Scope of the Evaluation*

The CBRLM evaluation is designed to test the impact of the various activities within the CBRLM intervention on household income, cattle productivity, and the condition of the rangeland. The objective of both the intervention and the evaluation is to refine the programme so that Namibia can adopt and/or scale up after the pilot phase.

The Household Income and Expenditure Survey broadly attempts to measure changes in household income, expenditures, livestock (purchase, sale, expenditures, byproducts), crops (type, amount harvested, amount sold), savings, loans, and social cohesion between treatment and control from the baseline (April-June 2011) to the endline (April-June 2014). Additionally, the survey will provide summary information on the welfare and needs of farming households in the NCAs. Finally, the Household Income survey will allow us to analyse how characteristics like trust and cooperation function in the communities in our sample.

## 2.3    *Theory of Change*

The CBRLM programme seeks to address pressing issues facing communal farmers in Northern Namibia by taking a holistic approach that works to improve the livelihood of farmers by affecting the wellbeing of their cattle, the productivity of the rangeland, and the welfare of the household. Primarily, the development of a grazing and land use plan is expected to increase the availability of forage both in the long and short term by allowing some areas to rest and recuperate while farmers graze multiple herds together (in a "mega-herd") in other areas. At the same time, farmers will be educated on animal husbandry best practices, marketing techniques, and infrastructure improvements. It is hypothesized that these inputs, working in tandem, will result in higher income, improved livestock herds, and a more diverse and sustainable rangeland.

**Theory of Change**

**Needs**
- Overuse of the rangeland
- Poor marketing, business, and animal husbandry practices
- Lack of proper water and livestock related infrastructure

**Input**
- Grazing plan (creation of combined herds) and land use plans
- Training in marketing and animal husbandry best practices
- Infrastructur improvement

**Output**
- Farmers graze their animals together according to a predetermined grazing plan
- Increased offtake of animals when the animals are at peak condition
- Improved condition of animals and makeup of herds
- Better veternary and livestock management and care practices
- Improved water and other livestock related infrastucture

**Outcome**
- Household see increased income due to improved marketing and business practices as well as healthier herds
- Increased offtake of livestock, especially cattle

**Long Term Goal**
- Sustainability of rangeland and livestock herds in NCAs
- Improved wellfare of housheolds in the NCAs and closing of the income gap in Namibia

## 2.4    Main Research Questions and Outcomes

The principle research question for which the household survey data was collected is: What is the impact of the CBRLM activities on the wellbeing of cattle- and small stock-owning households in the intervention area?

In particular, we will evaluate the following:

R1. *Income* – Does the CBRLM programme improve the income of households in the intervention areas (e.g. through better marketing of livestock and by-products)?

R2. *Expenditures* – Does the CBRLM evaluation affect the expenditures of households (e.g. type of products purchased, net purchase)?

R3. *Access to financial services* – Does the CBRLM programme increase farmers' access to financial services (e.g. formal/informal savings, formal/ informal loan mechanisms)?

R4. *Offtake rate* – Does the CBRLM programme increase the sale of livestock in formal and informal markets? (including patterns of purchase and sale, amount received for livestock sold)

R5. *Livestock ownership* – Does the CBRLM programme impact the number of animals owned by farmers?

R6. *Knowledge/Perceptions of animal husbandry practices* – Does the CBRLM intervention improve farmers' knowledge of animal husbandry best practices? (e.g., expectations of market prices, veterinary services, objectives for owning livestock)?

R7. *Heterogeneous effects* – Does the impact of the CBRLM programme vary by region, by initial level of education, or by other demographic characteristics such as whether the decision-maker for the household lives outside of the household?  Likewise, do communities that have higher levels of trust, social cohesion, and/or social participation respond better to the CBRLM programme?

## 2.5    Strengths and Limitations

As indicated above, we will evaluate the effect of the CBRLM programme on various outcome measures. The 2,964 data points from the household survey will be supplemented by data from the cattle baseline assessment and a possible  rangeland assessment.

The CBRLM Household Survey data set offers a unique insight into rural farming communities in the NCAs often overlooked due to small herd sizes and difficulty of access. The survey instrument includes questions about informal cattle sales (sale of

livestock to neighbours, speculators, persons from Angola) that allow for a basic calculation of offtake that differs from market side calculations. Questions that centre on reasons for sale, determination of prices, and goals and challenges for owning livestock offer an in-depth look at not only the use of animals in the sample area, but also the motivations of farmers.

In addition to collecting novel and interesting information on farming practices, the CBRLM Household Survey compiled a unique set of data on behaviour and social preference through a module on social cohesion and a series of behavioural activities. Behavioural activities or the replication of social scenarios through games has become a standardized method for collecting information on previously unobservable indicators such as trust, reciprocity, and altruism. Still a fairly new method of data collection, the behavioural activities as implemented in Namibia represent a unique data set for their scope as well as for their inclusion of measures of trust of persons in positions of authority (the village head).

A potential weakness is that the final sample ended up with a number of households, primarily in the Omusati region, for which information was recorded for transient herders rather than permanent household members. This presents two problems. One, the data collected from the herder may be less reliable as they often have less knowledge of the marketing aspects of the cattle as well as household finances. Two, these households will be more difficult to locate during the endline assessment as GIS coordinates have proven to not be entirely reliable in this regard.

Household income and expenditures as collected by the CBRLM Household Baseline Survey fall significantly below average household income figures collected by the Namibian Household Income and Expenditure Survey (NHIES). The definition of the household used for the CBRLM survey excludes family members living outside of the household, but who may contribute significantly to household income through migrant labour. While these inflows should be recorded under "remittances", it may be beneficial to review and/or expand these sections at the endline.

The design of the RCT identified forty-one RIAs or intervention zones with commonly-agreed-upon boundaries that share a common authority. Twenty of these RIAs were randomly selected to be control and twenty-one were randomly selected to be treatment. In order to maximize power, GOPA also identified a subset of grazing areas in each RIA where they felt it was more likely they would work (referred to as "green" or "green green" areas). Specifically, GOPA estimated that 70% of its intervention activities would take place in these pre-identified areas. The Household Income survey sample was therefore drawn from a list of all households in the villages listed in the green-green grazing areas in GOPA's eligibility report.

However, as GOPA has begun its intervention activities, it has become clear that this earlier identification of probable intervention locations was inaccurate. As a result, MCA, MCC, GOPA, and IPA are currently working on a strategy to assess the degree of overlap between the areas where GOPA is *actually* working and the areas where the household survey took place. This is an important determination since the level of compliance to random assignment has a major impact on the study's MDE. Specifically, to account for imperfect compliance we multiply the MDE by *1/((c-s))* where *c* is the share of subjects initially assigned to the treatment group who receive the treatment and *s* is the share of subjects initially assigned to the comparison group who receive the treatment. If, for example, compliance to treatment is 70%, then the initial MDE range of 0.21 and 0.33 swells to 0.30 and 0.47 – the small- to medium-sized range reported above. If, however, it turns out GOPA chose to work in very few of the pre-identified 'eligible' areas, say 35%, then the adjusted MDE range swells all the way to 0.60 to 0.94 – which is undesirable in that we may struggle to observe very real but non-large effects.

## 3.    SURVEY METHODOLOGY

NORC, hired by MCA-N, was in charge of the data collection, cleaning, and monitoring efforts for the baseline Household Income and Expenditure Survey. NORC subcontracted the Namibian based survey firm, Survey Warehouse (SW), to collect the baseline household data. MCA-N also contracted Oxford Policy Management (OPM) to provide consultancy services for the Data Quality Review (DQR) of the Namibia sub-activities, including, but not exclusive to, the CBRLM programme. The following section seeks to provide context for the data analysis through a summary of the data collection and review efforts undertaken by NORC, SW, IPA, MCA-N, and OPM.

A more detailed account of this information can be found in:

1.) *Data Quality Review: ex-post Review of the Community-Based Rangeland and Livestock Management (CBRLM) Evaluation Baseline Survey (November 2011)*

2.) *Survey Field Report: Implementation of Community-Based Rangeland and Livestock Management Household and Expenditure Surveys. (August 2011).*

3.) *Final Survey Report: Implementation of Community-Based Rangeland and Livestock Management Household and Expenditure Surveys. (November 2011)*

### 3.1    Survey Organization

The field work structure was designed by Survey Warehouse in conjunction with NORC, contracted by MCA-Namibia. There were seven field teams, one team in each of the six northern regions and two in the Kunene region due to the large number of households and vast geographic area. A team consisted of a supervisor, a data editor, and five enumerators. (Survey Field Report, 2011)

### 3.2    Pilot Exercises

The survey work was preceded by four pilot exercises aimed at testing and evaluating the survey instrument and its modules. These included an initial pilot test of the survey in October 2010, a series of focus groups in December 2010 to improve the language and targeting of baseline survey question, a pilot of the behavioural activities in February 2011, and a final pilot of the full CBRLM Baseline Household Survey in March 2011.

### 3.3    Training

Training for the CBRLM household survey began on April 4th, 2011 and ended on April 11th, 2011 and was organized by NORC and SW. During the training there were 4 days allotted for training on modules A-H and 2 days allotted for training enumerators and supervisors on modules J and K, which included the behavioural activities. In field training occurred on April 14 and April 15 to help the enumerators and supervisors get used to the challenges of the field and allow NORC, IPA, and MCA-N staff to observe the enumerators.  (Final Survey Report, 2011)

### 3.4    Questionnaires, and Manuals

The main survey manuals were: CBRLM Enumerator Manual, CBRLM Supervisor Manual, Behavioural Activities Enumerator Manual, and the Behavioural Activities Supervisor Manual. In addition, power point presentations were used during the training to aid in teaching the survey information to the enumerators and supervisors. The primary baseline survey manuals were prepared by NORC, while the additional Behavioural Activities training materials were prepared by IPA.

The CBRLM questionnaire was developed by NORC with coordination with IPA and MCA-N as well as comment by other stakeholders (Appendix C). A second

questionnaire for the village head was developed by IPA to determine payout for the behavioural activities.

In addition to the questionnaire there were daily tracking, back check, and questionnaire review forms designed by NORC. Each team was supplied with Behavioural Activity Worksheets to calculate payout for each household. These supplementary forms can be found in Appendix C of this document and in the Final Survey Report, 2011.

## 3.5 Mobilization

Before the beginning of the field period, letters were sent by MCA-N to the traditional authorities in the Kavango, Ohangwena, Oshana, Oshikoto, and Omusati regions. Letters were also sent to the constituency councillors in the appropriate areas by Survey Warehouse and radio announcements were made.

## 3.6 Survey Design and Implementation

The target population of the CBRLM Baseline Household Survey was livestock owning households as determined by the listing exercise that took place in December 2010 through March 2011.

The sample size was chosen in order to detect a small to medium sized effect of the CBRLM programme on households in Northern Namibia. Our sample size for this evaluation is 3,500 households (1,750 households from the treatment group, and 1,750 households from the control group), where the distinction between treatment and control is done by random assignment. The sample size was increased by NORC from 3,000 to 3,500 due to flooding in the NCAs in March of 2011 and the concern that a large proportion of household would be inaccessible. (For more on the sampling, see Appendix B).

## 3.7 Survey Monitoring

The in-field training was monitored by the SW Field Manager, NORC staff, MCA-N personnel, and IPA staff. The first week and a half of the field period was monitored by IPA staff as well as monitoring by the SW Field Manager. A second field monitoring trip was taken by both IPA staff and the SW Field Manager. A Trip Report from IPA staff can be found in Appendix C.

A third party Data Quality Review (DQR) Team was present for the in-field training as well as a separate review during the third week of data collection. The DQR team presented their findings on May 26th, 2011 and issued a written report on November 8th, 2011. (Field Survey Report, 2011; Final Survey Report, 2011)

## 3.8    Data Collection and Processing

The Baseline Household Survey was conducted from April 20th to June 26th 2011 with the endline Household Survey to be conducted during roughly the same time period in 2014.

The surveys were completed using paper surveys. The data was subsequently double entered and cleaned by Survey Warehouse using the programme Epi Data. Questionnaires missing items on the critical item check-list were still data entered, but flagged as incomplete."(Field Survey Report, 2011)

Data analysis will be done using the statistical software package, STATA. Most analysis will be done using regression analysis to determine any casual relationship between the CBRLM programme and the various outcomes described above. The baseline data analysis will consist of summary statistics of important measures and further analysis of the behavioural activities. (Field Survey Report, 2011; Final Survey Report, 2011)

## 3.9    Definitions

**Household**: People that live in the same compound and take meals together at least four days a week as well as young children that live elsewhere but are answerable to the head of household.

**Own**: Animals that one can sell without anyone else's permission

**Value**: If one took the item to sell today, what price would you expect to receive for it

# 4.    FINDINGS

## 4.1    *Response Rate[1]*

The final sample consisted of 3,786 households for which interviews were attempted across the forty-one RIAs in our study. The final number of completed questionnaires was 2,964 for a response rate of 78.3% with 21.7% non response:

**Figure 4.1.1 Reasons for Non-Response**
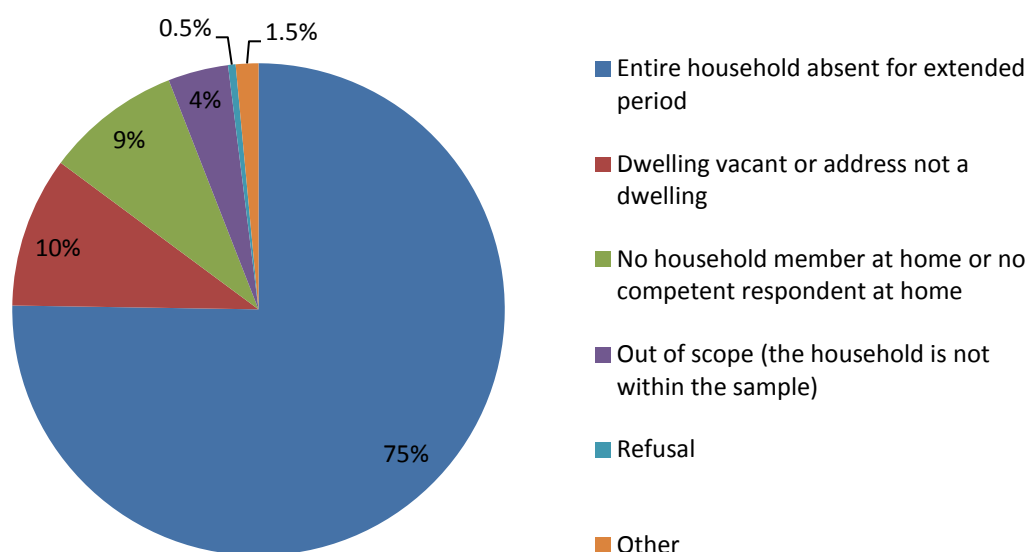


## 4.2    *Balance*

Because randomization was done prior to the implantation of the baseline – making it impossible to stratify on baseline measures – it is important to check that our treatment and control groups are balanced. To do this, we compared mean values of the following important variables: 1) number of cattle owned; 2) household income; 3) amount given in the second behavioural activity (we included a social cohesion measure because it was hypothesized during discussions in October/November 2010 that these would be the first measures affected by the CBRLM intervention.) The t-test results point to balance across these variables, with p-values greater than 0.1 for all the three indicators.[2]

---

[1] Field Survey Report, 2011

[2] There is also balance between treatment and control for the amount of money spent on cattle over the past 12 months, total weekly expenditures, household size, and the amount households have in savings.

**Figure 4.2.1: Mean and Confidence Intervals, Broken Down by Intervention and non-Intervention Area for:**

| Total Cattle Owned | Total Income | Contribution in Public Goods Game |
|---|---|---|



Pr(T < t)        = 0.4248
Pr(|T|>|t|)   = 0.8496
Pr(T > t)        = 0.5752

Pr(T < t)        = 0.3342
Pr(|T|>|t|)   = 0.6684
Pr(T > t)        = 0.6658

Pr(T < t)        = 0.1304
Pr(|T|>|t|) = 0.2608
Pr(T > t)        = 0.8696
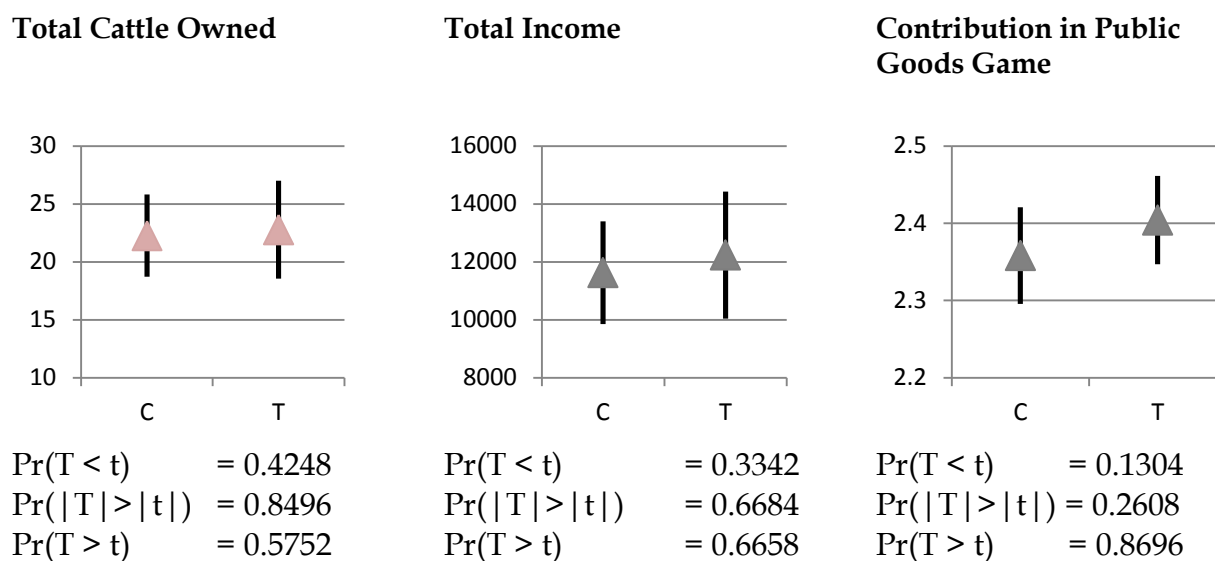
## 4.3    Timing

The survey took on average 93.8 minutes to complete.[3]   Past survey experience has shown that the more familiar enumerators become with the survey, the less time it takes to administer the survey.  This is also true for the CBRLM Household Survey.  One can see in Figure 4.3.1 how the average time it takes to administer the survey decreases with days in the field.  This is important information to take into account for future timing exercises.

---

[3] This number was arrived at after dropping unrealistic measures that were most likely the result of enumerator error, such as 1 minute and anything above 11 hours. The high times are likely either due to enumerator error or surveys that stopped and were continued later or the next day. The DQR team noted additional time anomalies, such as survey that ended or started at unrealistic times in the very early morning or quite late at night.

**Figure 4.3.1: Length of the Survey over Time**
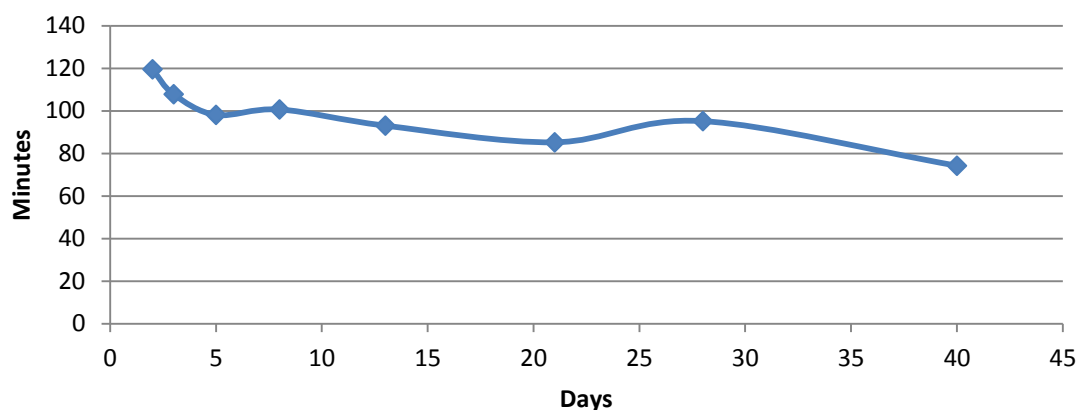


A time decrease can indicate increased familiarity with the survey instrument or the taking of less detailed information as a result of enumerator fatigue. To examine the latter possibility, we ran t-tests on key variables that could change as a result of enumerator fatigue, such as total number of cattle sold, whether or not the household had any savings, total income, household size, whether or not household members held jobs outside the home, and whether or not the household grows crops.[4]

The ttests for number of cattle sold, savings, and crop production indicate no difference between the first half of the survey period and the second half of the survey period with p values all greater than 0.1. The ttest for total income, household size, and jobs held outside the home, however, do show a significant difference in means, with less income, smaller households, and fewer households with jobs outside the home recorded in the second half of the survey,. Figure 4.3.2 reports the statistics for household income, household size, cattle sold, and crop production. The rest of the data can be found in Appendix A.

---

[4] Surveys from the second half of the survey period, i.e., the 1,483 surveys completed after the 24th of May were compared to the 1,482 surveys completed in the first half of the survey period. Many of these questions, if answered "No" allowed the surveyor to skip entire sections. Similarly, the less household members,, the shorter the lengthy household roster process.

**Figure 4.3.2: Mean and Confidence Intervals for:**
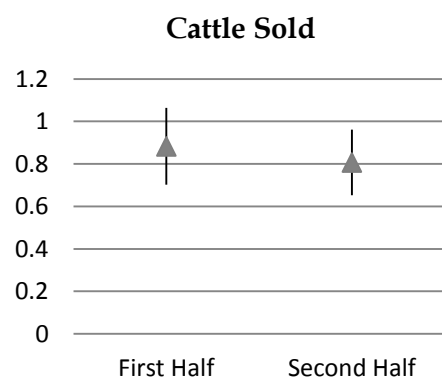
### Cattle Sold



| | |
|---|---|
| Pr(T < t) = 0.7347 | |
| Pr(\|T\| > \|t\|) = 0.5307 | |
| Pr(T > t) = 0.2653 | |

### Savings



| | |
|---|---|
| Pr(T < t) = 0.4564 | |
| Pr(\|T\| > \|t\|) = 0.9127 | |
| Pr(T > t) = 0.5436 | |

### Total Income



| | |
|---|---|
| Pr(T < t) = 0.9652 | |
| Pr(\|T\| > \|t\|) = 0.0697 | |
| Pr(T > t) = 0.0348 | |

### Household Size



| | |
|---|---|
| Pr(T < t) = 0.9899 | |
| Pr(\|T\| > \|t\|) = 0.0201 | |
| Pr(T > t) = 0.0101 | |
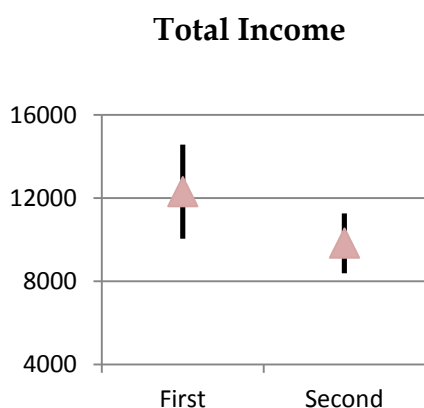
## 4.4    *Household Information*

The CBRLM Household Income and Expenditure Survey collected a number of demographic characteristics including the age, sex, and education levels of household members, as well as information on key decision-makers that may live outside the

household. This demographic data may be used later on to test for the presence of heterogeneous treatment effects (e.g., the effect of the programme on female headed households, more educated households, etc).  In addition, household demographic information offers a more in-depth picture of the sample population which may enable better targeting of service delivery.

The average household size in our sample is 5.84 household members.  Household size varies by region with the largest average household size found in Kavango and Oshikoto, and the smallest in Omusati (See Figure 4.4.1).

**Figure 4.4.1 Household Size by Region**[5]
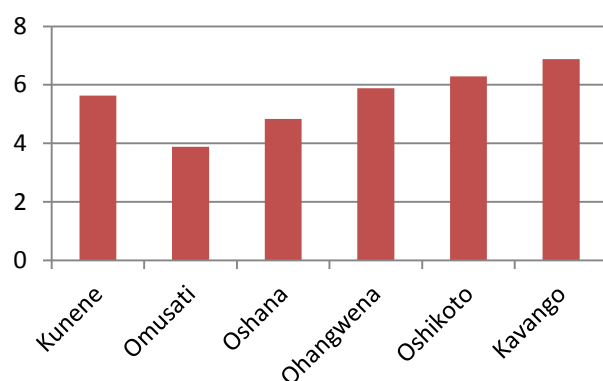


Our sample shows an especially young population with 46% of the population under the age of 16 as opposed to around 37% in the 2009/2010 NHIES household data (See Figure 4.4.2).  The sample is split fairly evenly between male and female, which puts the sex ratio (as defined as the number of males per 100 female) at 97.6, well above the 90.7 recorded by the 2009/2010 NHIES. Omusati and Oshana are recorded as having more males in the sample than females with sex ratios of 150 and 119 respectively. This is much higher than the recorded 85 and 79 recorded in the 2003/2004 NHIES data.[6] One possible explanation may be that our sample area regions, especially Omusati, had a higher population of cattle posts and therefore herders, who are male.[7]

---

[5] Kunene: 5.6; Omusati: 3.88; Oshana: 4.84; Ohangwena: 5.89; Oshikoto: 6.29; Kavango: 6.88

[6] At this time, not all of the data from the 2009/2010 NHIES data is available to the public.
[7] Additionally, the Oshana Region was most heavily affected by the flooding so the number of households sampled is much less, allowing for possible bias and a greater affect of specific household characteristics.

**Figure 4.4.2 Proportional Breakdown of Age Ranges of Households**
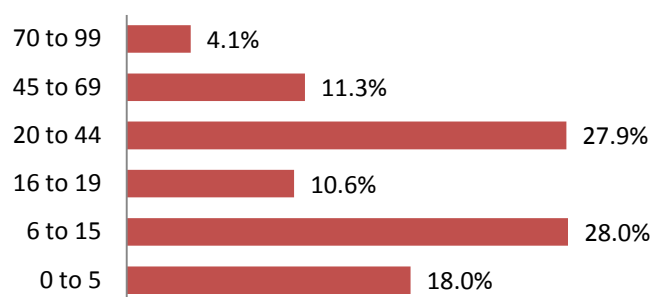


The majority of persons of school age (between the ages of 5 and 16) in our sample are currently attending school (See Figure 4.4.4). Of current 16 year olds in our sample, only 8.88 % have never attended school. This is an improvement from 20 years ago (those aged 35 in our sample) when 24.48% of the sample report they have never attended school and a marked improvement from 35 years ago (i.e., for those aged 50 in the sample), 42.98% of whom report they have never attended school.

**Figure 4.4.4: Schooling of Household Member of School Going Age**
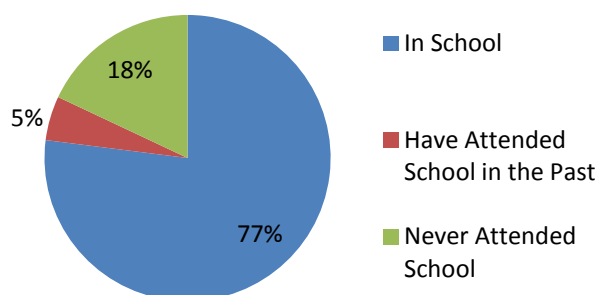


The data collected from the baseline survey confirms that the majority of households (62.16%) are headed by men.[8] The definition of the household used for this survey included only those members who live in the same compound and take meals together at least four times a week. Although questions remain about the CBRLM household definition undercounting the contribution of male migrant labour, it is interesting to note that the percent of male head of households is about 4% higher in the CBRLM data than that recorded in the 2009/2010 NHIES survey (57.1%), though this may be due to the bias generated by cattle posts. After removing "likely cattle posts" from the sample, the number of male headed households falls to 58.95%. This is still higher than the NHIES estimate, indicating that fears of undercounting male influence in the household may be unfounded.

---

[8] This is the number of male headed households as indicated by the household roster, i.e. those household members recorded as head of household members (01) in the household roster. This is the designation of gender of head of household that will be used for the rest of the report.

The CBRLM programme requires households to make significant changes to the way they manage their animals. In many cases, this may require the buy-in or motivation of the household's key decision maker, whether this person lives in the household or not. In our sample, 21.3 % percent of households had decision makers who lived outside the household. These decision makers are primarily male (85.4%) and were either identified as the head of household or as a cousin of the head of household (see Figure 4.4.5). 18.5% of female headed households had a male decision maker who lived outside the household.

**Figure 4.4.5: Relation of Decision Maker to the Head of Household[9]**
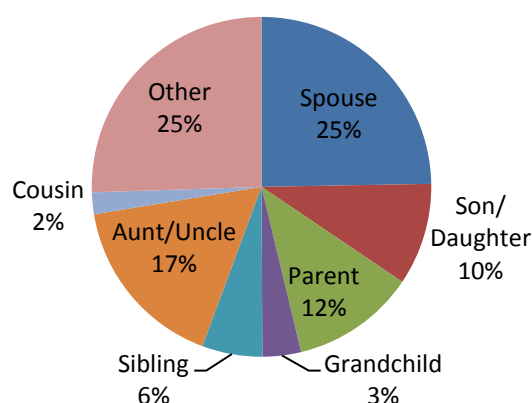


There is a discrepancy between the percentage of female headed households when asked the gender of the head of household (B1.1) and the gender listed as the head of household in the household roster (B2.3). As discussed above, the household roster indicates that 62.16% of heads of household in our sample are male. In question B1.1, 61.65% of heads of household are recorded as male. One hypothesis offered by the DQR team in their summary report is that the order in which "male" and "female" were listed on the survey instrument caused enumerator error. Again, however, it looks as if responses may be skewed by cattle posts. When asked the gender of the head of household in B1.1, slightly fewer "likely cattle posts" listed male, perhaps thinking of the gender of the employer. When asked to name the household head in the household roster, the percent of males listed increases by about 1%. The most accurate measure of gender of head of household, therefore, is likely to be gender listed by the household roster with "likely cattle posts" removed, or 58.95% male headed.

---

[9] Though a different person may be listed as head of household on the household roster according to our definition of the household, often respondent identified a separate person as the head of household in this question. Additionally, respondent's understanding of cousin if often not their aunt or uncle's child, but a close relative or family friend.

While 54% of head of households have received some schooling, more than half (51%) the individuals identified as 'head of household' did not complete primary school. We also find that 10% completed secondary school and 3% hold post-secondary degrees (See Figure 2.4.6).

**Figure 4.4.6: Portion of Head of Households that Stopped Attending School Each Grade Level**
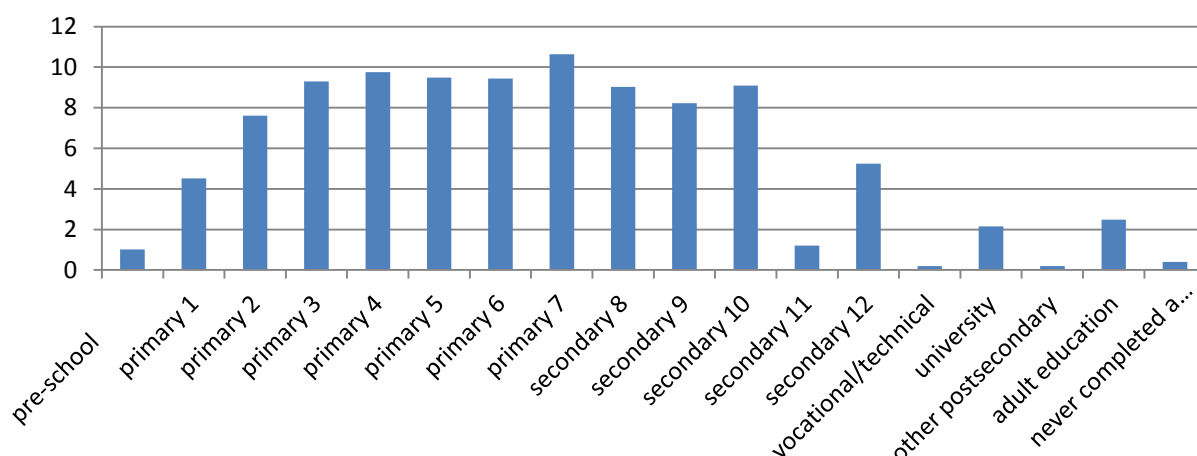


Households in our sample overwhelmingly use firewood as their main source of fuel (98.3%) and either surface water (20.5%), public tap (27.8%), or borehole (30.9%) as their main source of drinking water.

In the endline, some of the household information from the baseline may be used for sub-group analysis. One could analyse whether the sex and education level of the head of household effects the success of households in the CBRLM programme with the hypothesis that more educated and male headed households may take up the programme more easily then less educated or female headed households (who historically have less control over the cattle). Additionally, it may be possible to observe whether having a decision maker who lives outside of the household affects uptake and/or success of the CBRLM intervention. Household with absent decision makers may simply not be able to implement the strategies put forth by the CBRLM programmes due to a lack of authority regarding the cattle.

## *4.5    Income*

Descriptive statistics from the baseline survey data will provide us with a better understanding of the financial status of farmers in the NCAs before being introduced to the intervention.

A variable of aggregate income was generated by summing the following income inflows over a year:

- Income earned at jobs outside of the farm (monthly) by in money and in kind;
- Income earned from non-labour, non-agricultural sources such as remittances (annual);
- Income generated from the sale of crops (annual);
- Income generated from the sale of animal byproducts (annual); and
- Income generated from the sale of livestock (annual);

Average annual household income among our sample population is 11,064 NAD per year.[10] 18% of the sample reports having received no income in the form of money in the past 12 months. As discussed in the Expenditure Section, the questionnaire may undercount cash inflows, either to shortcoming of the survey instrument or households underreporting income in hopes of receiving future services.

Figure 4.5.1 breaks down annual household income by type, indicating that the largest inflow come from either jobs outside the home or other non-labour, non-agricultural income rather than from the marketing of products produced on farms.

**Figure 4.5.1: Average Annual Household Income (NAD) by Income Type**
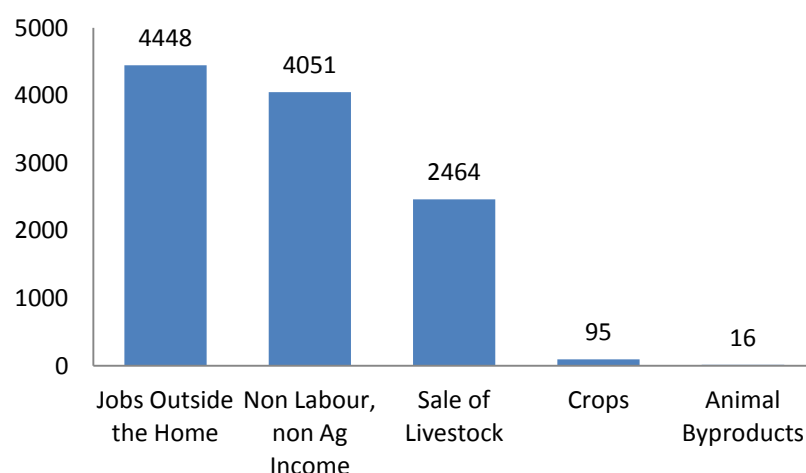


Average household income in Namibia as recorded by the NHIES 2009/2010 data is around 68,878 NAD with an average of 42,893 NAD for the rural population. It is important to note, however, that the NHIES data uses a consumption measure of income rather than aggregating the recorded income streams. The more accurate

---

[10] Median of 6,000 NAD

comparison will be to compare household consumption from the NHIES data and total expenditure in Section 4.7.

Though at first glance, income generating activities outside of the households appear to account for about 40% of the average household income in a given year, only 15.58% of households in our sample earn income away from the household farm. When the sample is split by households that earn income outside the home versus those who do not, the average yearly income becomes 36,126 NAD and 6,438 NAD respectively, representing a serious dichotomy amongst the survey population.

The CBRLM Household Income and Expenditure Survey was designed to record information about households, rather than data from cattle posts. Looking at the data, however, it is likely that some of the "households" recorded in the sample were in fact cattle posts with herder information collected rather than household information. In order to unpack this effect on income, a variable has been created to estimate the number of cattle posts in the sample. We assume that single person households and or households with two persons where the second person is of no relation to the first have the highest likelihood of being cattle posts. Using this estimator, close to 400 households in the sample are "likely cattle posts".

Average income of "likely cattle posts" is 6,541 NAD, well below the sample average of 11,064 NAD. Removing likely cattle posts from the full sample thus increases average income by 685 NAD.[11] The most common employment outside of the household is unskilled agricultural labour, followed by other unskilled labour, skilled labour (such as carpentry or bricklaying), teaching or education, and government, respectively.

Apart from jobs outside of the home, households also earn a large portion of their annual income through other non-labour, non-agricultural revenue, such as remittances, pension, and other small business ventures. Unlike the low rate for income earned through employment outside the home, these payments are received by over half (63%) of the sample.

The most common non-agricultural non-labour income flow in our sample is pension money, followed by remittances and small business income (Figure 4.5.3). While pension grants also account for the largest average annual monetary inflow, child grants and maternity payments make up a large average sum for smaller percentage of households that receive the payments (Figure 4.5.5).

---

[11] A likely cattle post with job outside of the homestead has an average income of 21,544 NAD and likely cattle posts with no jobs outside of the homestead report an average annual income of 5,231 NAD

When compared to the NHIES 2009/2010 data, a higher percentage of households in the CBRLM sample receive pension payments as well as remittances as their primary source of income (Figure 2.5.4).

**Figure 4.5.3: Percent of Households Who Received Non-Agriculture and Non-Labour Payments**
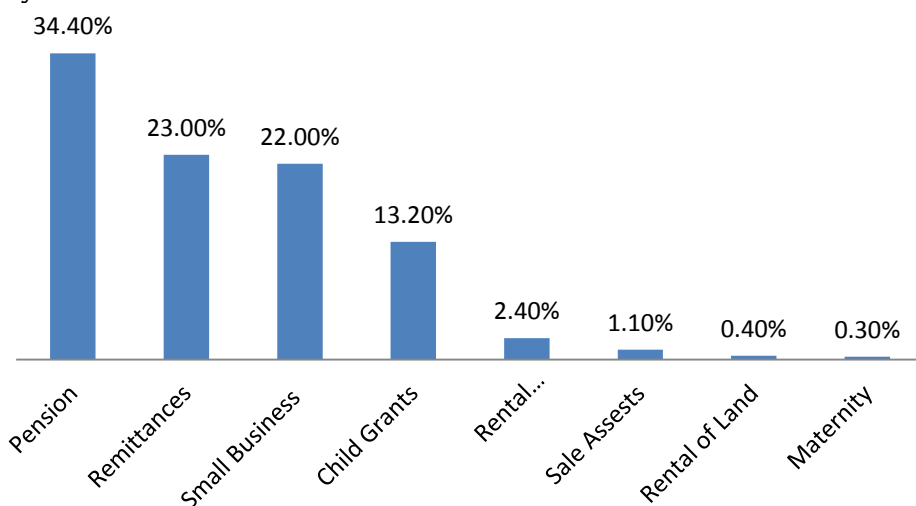


**Figure 4.5.4: Percentage of Household Receiving Income Payments as Primary Income Source Compared to NHIES 2009/2010 data**
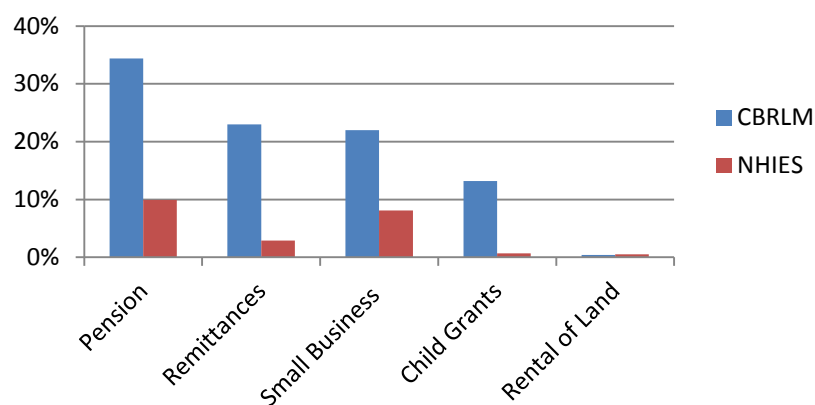
**Figure 4.5.5: Average Amount (NAD) Received by Entire Sample (Red) as well as Average Amount (NAD) Received by Households that Received Payments (Blue)**
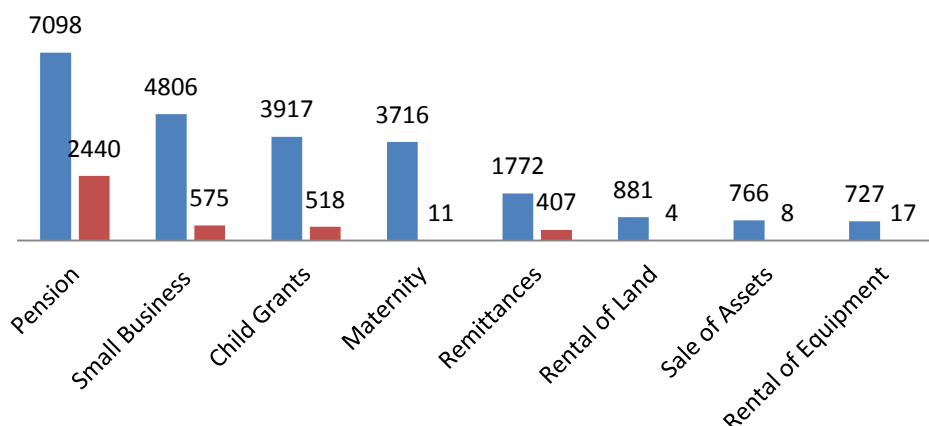


During the past 12-months, households that received remittances, received on average, 1,772 NAD. Women over the age of 18 were the primary recipients of remittances, small business revenues, and child grants. Male children were more frequent recipients of child grants, though the difference is slight at 78 male recipients versus 69 female.

The majority households do not have any kind of formal or informal savings (68.2%). Those who save, have an average of 3,558 NAD saved. The most common method of savings is in a bank (See Figure 4.5.6) and about half of households site "in case of an emergency" as the reason for accumulating savings. Access to saving methods may be important towards encouraging households to market their animals as more economically prudent times of the year and save the revenue for later payments (funerals, school fees, etc).

**Figure 4.5.6: Savings Locations**
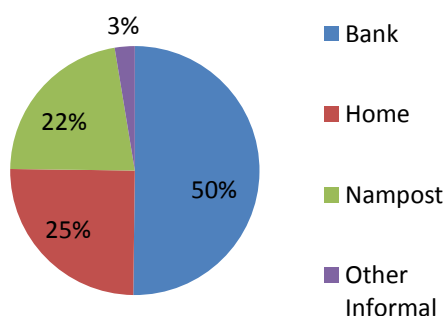


The baseline survey indicates that only 5% of households have at least one outstanding loan. The most common reason for taking out a loan is described as for household or personal use, and most households who had an outstanding loan borrowed that money from a friend or a neighbour. Only 1.2% of households borrowed from a formal institution (bank or microfinance institution).

## 4.6    Livestock

### 4.6.1    Cattle Ownership and Offtake Rates

The data from the baseline survey indicates that 66% of households own cattle. For cattle owning households, average herd size is recorded as around 34 animals.[12] Cattle owning households are most frequently found in Kunene and appear less frequently in the sample in the Oshana and Kavango Regions (See Figure 4.6.1.1).

**Figure 4.6.1.1: Percent Cattle Owners by Region**



The perception of cattle owners in the NCAs is that they lack a commercial or market oriented focus to their livestock practices. The baseline survey report indicated that cattle are rarely sold, 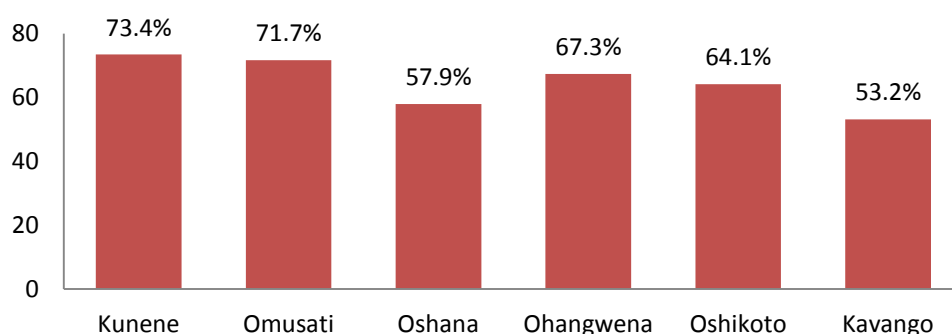and when they are, it is generally to cover an emergency or bulk payment such as a hospital bill or funeral expenses. As such, farmers accept lower prices than they believe their cattle are worth due to the pressing need for funds. There exists an opportunity to train farmers to sell at times when cattle are most marketable and then save that money for expenses during the year, thus improving profitability and encouraging future market related enterprises.

Overall offtake rate includes consumption and ceremonial slaughter as well as marketed offtake.[13]Average cattle offtake per year in the CBRLM sample is about 2.3 animals with a distribution that trends heavily towards zero (Figure 4.6.1.2)

---

[12] Through the CBRLM cattle assessment and other related exercise, it has become clear that farmers are systematically inaccurate when estimating the size of their herd by, on average, about ten cattle in either direction. This may be either due to a lack of focus on the actually number of animals in the herd or a desire to either inflate or deflate the numbers for the enumerators.

[13] This does not include number of cattle lost, stolen, or eaten by predators in a given year

**Figure 4.6.1.2: Total Offtake by Household**
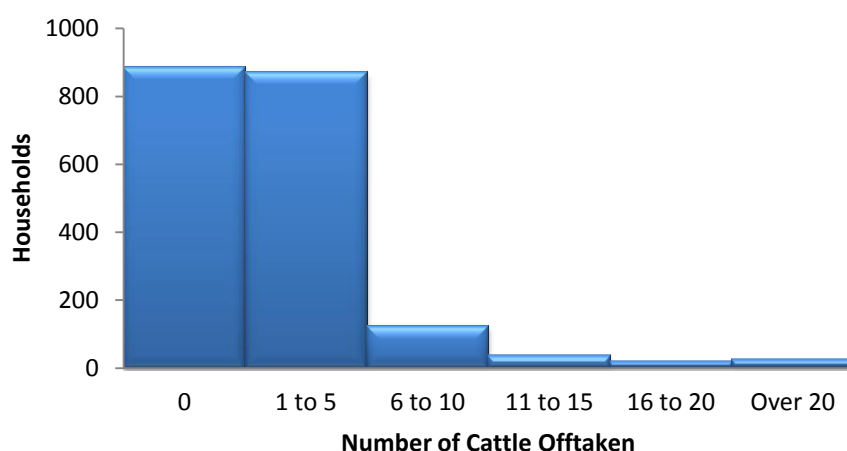


Cattle farmers in the sample offtake about 10% of cattle owned per year. This percentage varies by region with Kavango and Kunene recording the highest offtake rates at a little over 12% (Figure 4.6.1.3). Offtakes rates do not differ significantly with the gender of the head of household. Percent offtake decreases as herd size increases and households have to offtake more cattle to reach the 10% average. (See Figure 4.6.1.4). These differences are significant at each herd size.

**Figure 4.6.1.3: Offtake Rate by Region**
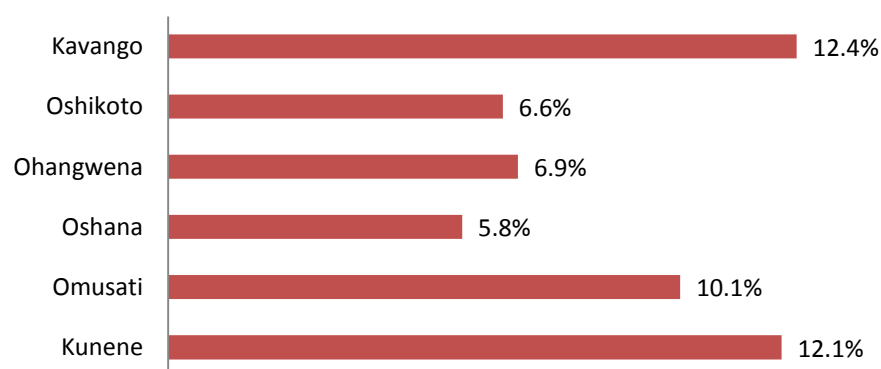
**Figure 4.6.1.4: Offtake Rate by Herd Size**
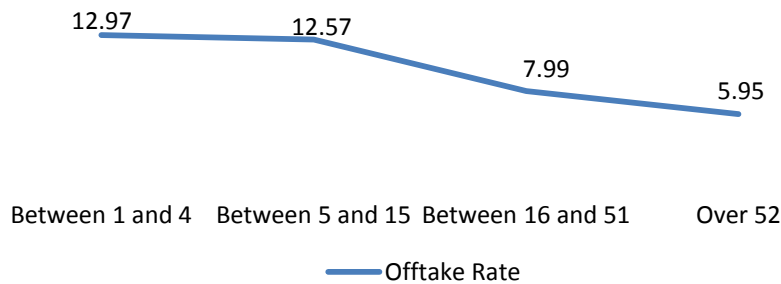


The categorical variable "herd size" was generated to create a normal distribution of herd size for cattle owning households. To achieve this, a variable which equalled the log of the variable "number of cattle owned" was created and then the levels of herd size chosen in reference to standard deviations from the mean number of cattle owned. The distribution can be seen in Figure 4.6.1.5.

**Figure 4.6.1.5: Distribution of the Variable Herd Size**
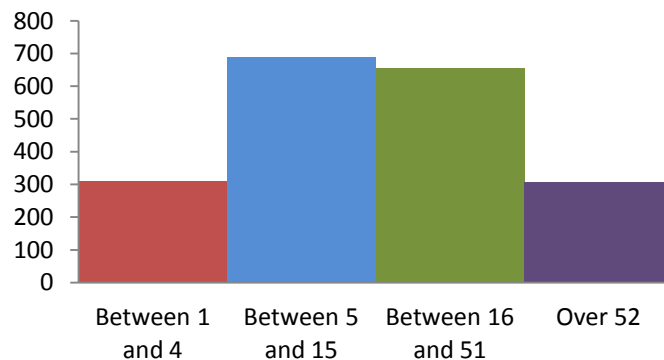


Only thirty four percent of cattle owning households sold cattle in the past year. This number varied by region with more households in Kunene and Kavango selling cattle both in real terms and as a percent of the population (See Figure 4.6.1.6).

**Figure 4.6.1.6: Percent of Households that Sold Cattle in the Past 12 months by Region**
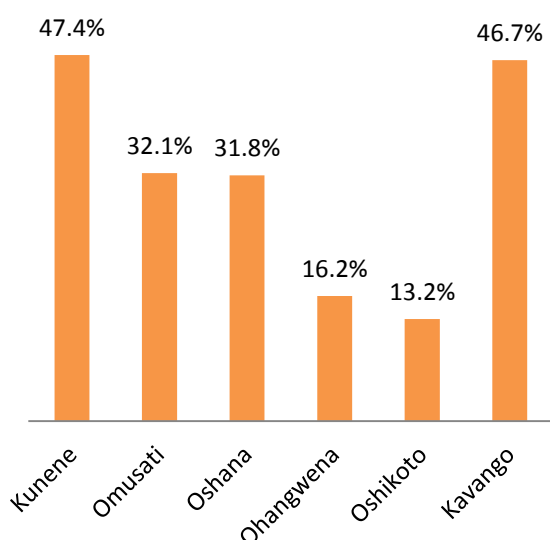


**Figure 4.6.1.7: Percent of Cattle Sold by Households that Sell Cattle in the past 12 months by Region**
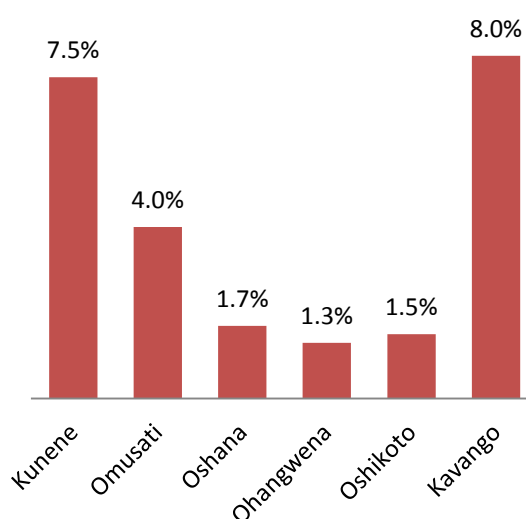


Households that sold cattle sold on average 3.66 cattle per year and their average herd size was 50 cattle. Oshana Region has the largest herd size followed by Omusait and Kunene. Removing the herd of 2,500 cattle found in the Oshana Region, the average falls from 171 to 60.9, yet remains the highest average herd size of the six regions in our sample (Figure 4.6.1.8). Households that sold cattle were generally wealthier and had a greater percentage of male heads of household. Male headed households also tended to sell a larger percentage of their herds despite having herd sizes almost twice as large as female headed households.

**Figure 4.6.1.8: Herd Size by Region**[14]



---
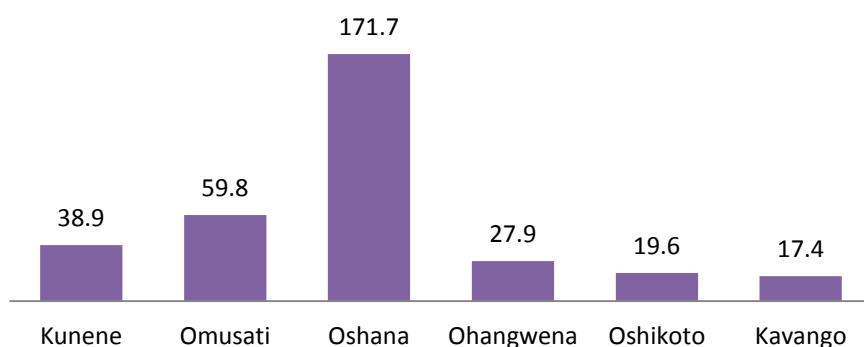
[14] Herd sizes are calculated for cattle owning households, i.e. households with at least one head of cattle

Cattle owners most commonly sold to private individuals (69.7%). Though more households were recorded as selling to private individuals, households that sold tended to sell fewer total cattle to these buyers (Figure 4.6.1.9). Total numbers of cattle sold to the respective buyers tells a similar story (Figure 4.6.1.11).

**Figure 4.6.1.9: Percent of Households that Sold to Select Buyers**
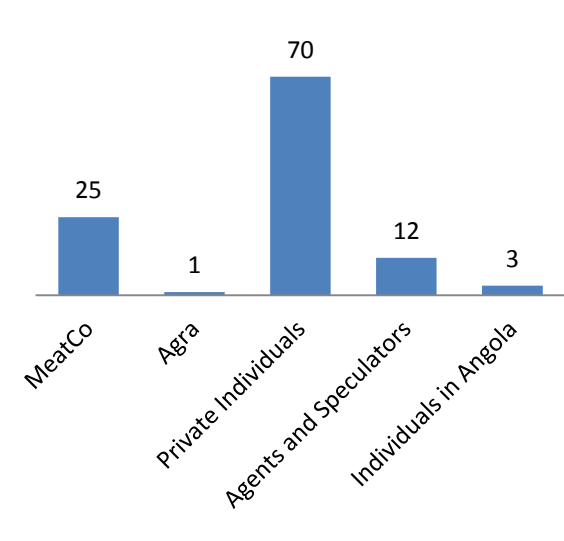


**Figure 4.6.1.10: Average Number of Cattle Sold to Individual Buyers**
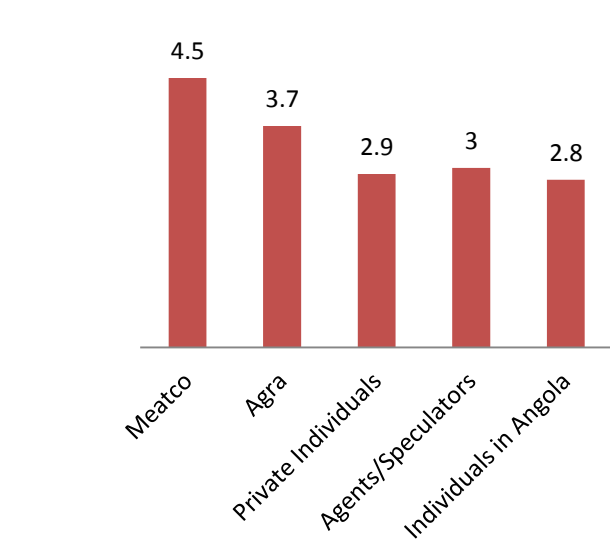


**Figure 4.6.1.11: Total Number of Cattle Sold to Buyers in the Last 12 months.**
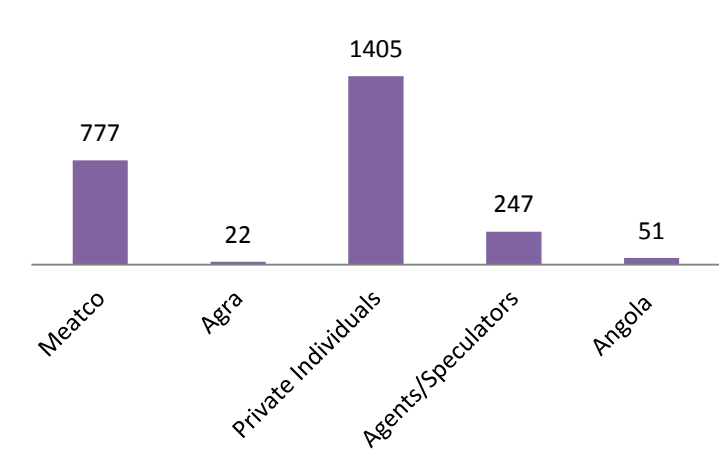


Cattle owning households in all regions favour sales to private individuals in Namibia. Agents and speculators are more active in Kavango and Kunene, while MEATCO buys from the most households in Kunene and Omusati (Figure 4.6.1.12). Cattle sales to various buyers do not differ significantly by the gender of the household head.

**Figure 4.6.1.12: Percent of Households that Sold to Buyers by Region**
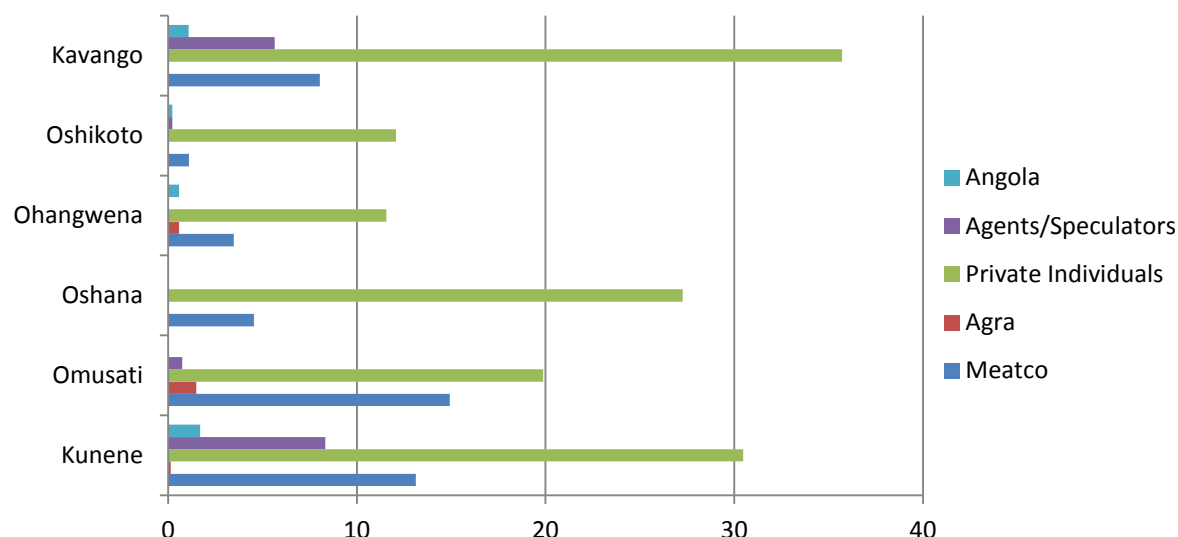


The average number of cattle sold increases exponentially with herd size (Figure 4.6.1.13), though not enough to keep the offtake rate stable. The proportion of household that have sold cattle in the past year by herd size follows the same upward trend. A higher percentage of household with large herds (those that own over 52 cattle) sell their animals than households with smaller herd sizes.

**Figure 4.6.1.13: Average Number of Cattle Sold by Herd Size**
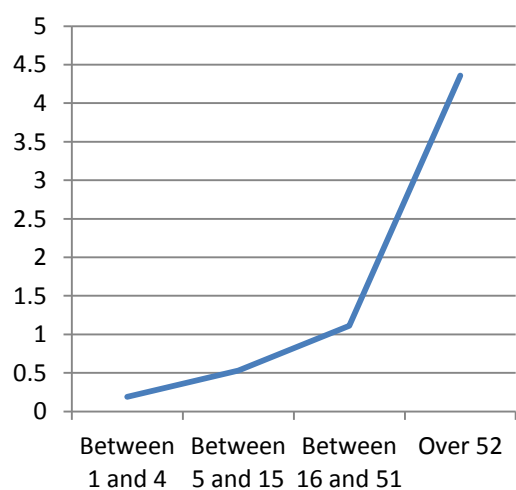


**Figure 4.6.1.14: Percentage of Households Selling Cattle by Herd Size**
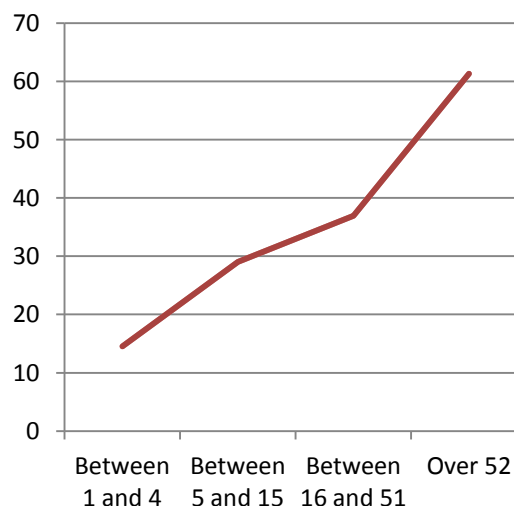
Households with larger herds sold more frequently to MEATCO than households with smaller herds. Conversely, households with large herds (over 52 cattle) sell less frequently to private individuals than households with less than 52 cattle. It may be more economically efficient for households with larger numbers of cattle to sell at formal auctions where they can sell a larger number of cattle at one time. This hypothesis is supported by Figure 4.6.1.10, which shows us that a larger average number of cattle are sold to MEATCO than to other buyers (Figure 4.6.1.15). .

**Figure 4.6.1.15: Percent of Household that Sell to Various Buyers by Herd Size**
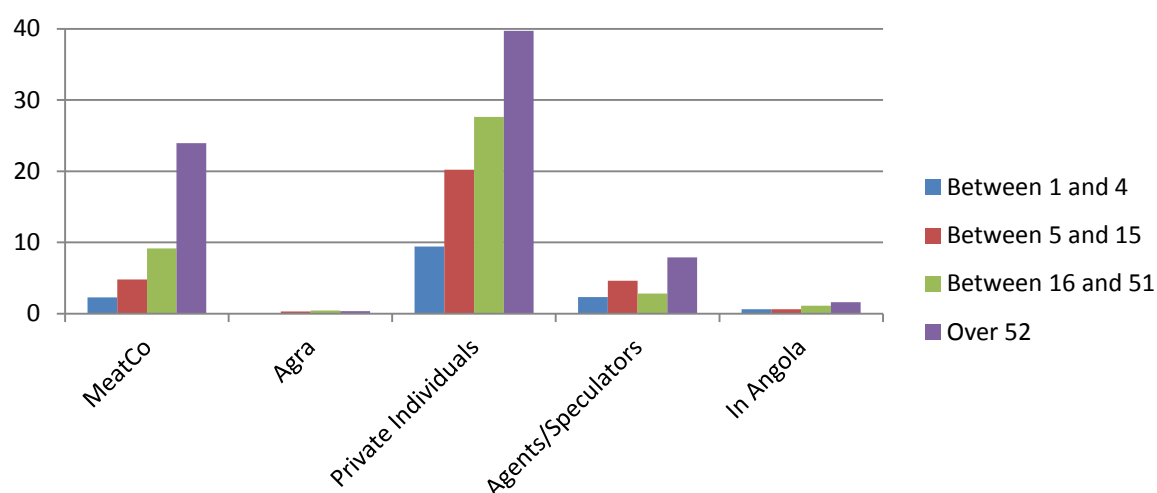


Farmers in the NCAs often view larger commercial buyers such as MEATCO as offering unfairly low prices. Farmers, however, reported selling a head of cattle to MEATCO at 2,693 NAD while the average price per head of cattle to private individuals was 2,675 NAD (See Figure 4.6.1.16). These means were not significantly different from zero.[15] As the majority of farmers sell to private individuals, often under the stress of pressing expenses, facilitating accessible and diversified market access farmers could increase their revenue from cattle sales.[16]

---

[15] A paired ttest reveals p value of greater than 0.1. The outlier of sales to private individuals of 130,000 NAD for two animals was removed. Even with the outlier as part of the average, there is no significant difference between the reported MEATCO price and the price reported as sold to privat individuals

[16] See Appendix A for results broken down by region , herd size, and gender.

**Figure 4.6.1.16: Average Price of Cattle Sold (NAD) to Individual Buyers**
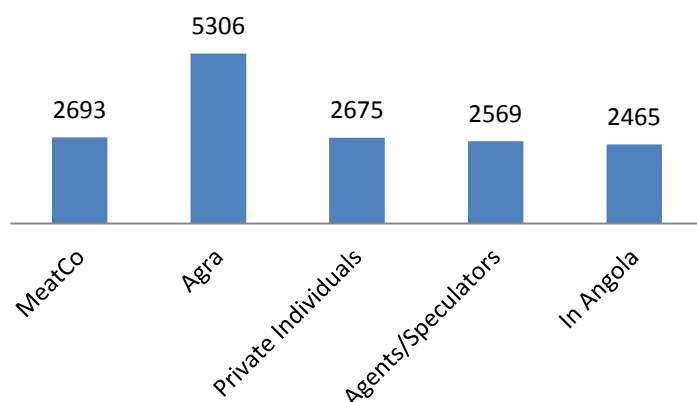


When asked if the price met with their expectations, 46% of those that sold to MEATCO reported no, however, 45% of those who sold to private individuals also reported that they were not happy with the price they received. The reasons respondents gave for not receiving their desired price centred on having to sell to cover an "emergency" expense. Though many of the expenses listed constituted unforeseen costs (funeral, crisis at home, and doctor's fees), others were annual costs or bi-annual costs such as school fee that households are capable of planning ahead for. Proper training and greater accessibility of saving mechanisms could improve profitability of marketing in the NCAs as well as encourage farmers to increase market offtake.

### 4.6.2 Cattle Consumption, Purchase, and Expenses

In addition to low market offtake rates, cattle farmers in the sample rarely utilize their animals for consumption. Only 7.6% of cattle owning households slaughtered cattle purely for consumption in the past 12 months. Of those that slaughtered for consumption, only around 2 cattle were slaughtered in the past year. Thirty-three percent of households slaughtered, on average, about 2.5 animals per year for celebration or ceremony (wedding, funeral, etc). This indicates that cattle are more commonly utilized for special events than to supplement daily consumption.[17]

The majority of cattle owning households have not purchased cattle in the past year (84.3%). Only 0.44 cattle were purchased per cattle owning household. Those household that did buy cattle bought an average of 2.8 cattle per year. The average cost of a head of cattle purchased by households in our sample was around 2,931 NAD. Looking at sale versus repurchase, on average, cattle owners that engage in marketing are decreasing their herd size by – 0.83 animals per year. Expanding this measure to include

---

[17] Cattle that are slaughtered for celebrations, such as funerals, are also consumed; however, they are consumed for ritual purposes rather than to fulfill a direct nutritional need so they are counted separately.

cattle that are born, lost or stolen, died, given as a gift, eaten, or slaughtered for ceremonial purposes, herds increased by 1.25 cattle per year.

Cattle owning households spend on average 1,765.50 NAD per year caring for their cattle with 34% of cattle owning households spending nothing on their cattle in the past year. The average amount spent per animal equals 98.65 NAD per head of cattle for households. For households that spent money on their cattle, 149.39 NAD was spent per cattle per year. These expenses include fodder/feed, hired herding, transport for animals, and medical costs (Figure 4.6.2.1). Cattle owning households earn an average net profit of about 1,370 NAD total on their cattle in a given 12 months.[18] This does not include non-monetary benefits that households derive from their cattle such as milk, dairy fat, meat, skins, and social value. These numbers contribute to the hypothesis that farmers in the NCAs primarily derive a non-monetary benefit from their animals in terms of social wealth and standing as well as other everyday household uses.

**Figure 4.6.2.1: Costs Associated with Caring for Cattle in the Past 12 months**

|  | Average Cost per Year (NAD) by cattle owning households | Average Cost per Year (NAD) for households that spend money on their cattle |
|---|---|---|
| **Fodder/Feed** | 415 | 617 |
| **Veterinary Expenses** | 422 | 632 |
| **Hired Labour** | 786 | 1169 |
| **Transportation** | 128 | 191 |
| **Other** | 17 | 25 |

As a percentage of cattle owning households, households in Omusati were most likely to spend money on their cattle, followed by Oshana and Ohangwena (Figure 4.6.2.2). Households in Omusati and Oshana spent the most on their cattle in the past twelve months (Figure 4.6.2.3). Though fewer households in the Kavango Region spend money on their cattle, those that do spend more per head of cattle than other regions by close to 80 NAD (Figure 4.6.2.4).

---

[18] The net amount made of cattle is represented as the amount of income received from the sale of cattle as well as the sale of cattle byproducts minus the amount spent on cattle in the past year in terms of fodder/feed, veterinary expenses, hired labor, transportation, and other costs.  Adding the cost of purchasing cattle in a given year, the average drops to 125.3 NAD

**Figure 4.6.2.2: Portion of Cattle Owning Households that Spent Money on their Cattle by Region**
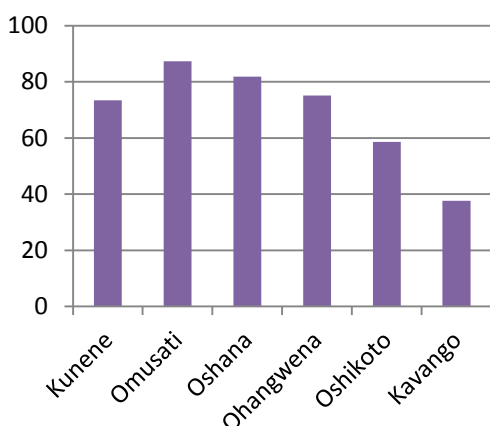


**Figure 4.6.2.3: Average Amount Spent on Cattle by Households that Spent Money on their Cattle**
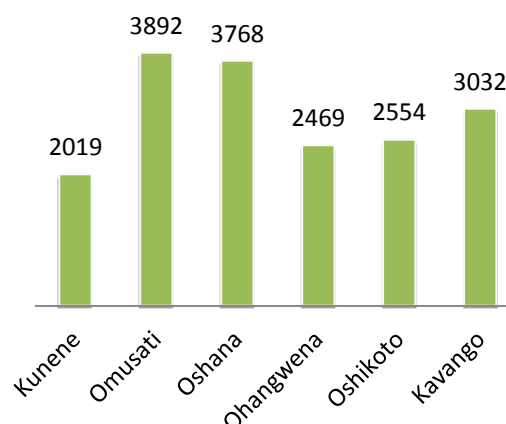


**Figure 4.6.2.4: Average Amount Spent per Head of Cattle by Households that Spent Money on Cattle in the past 12 months**
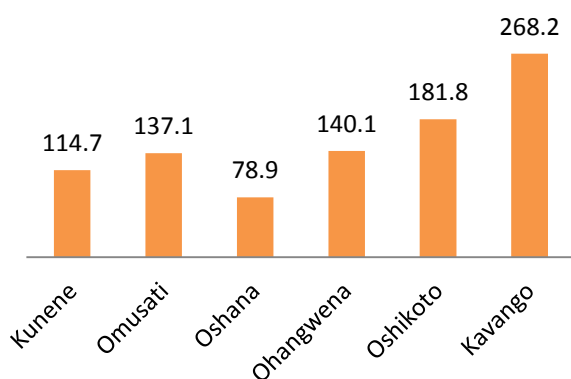


Fewer female headed households spend money of their cattle than male headed households (57.91 % versus 70%). While male headed households that spend on cattle spend more than their female headed households, female headed households spend more per head cattle by about 60 NAD.[19]

Households with larger herds are more likely to spend money on their cattle, increasing in a fairly linear fashion with herd size. Amount spent per head of cattle decreases with herd size, suggesting that either there are potential economies of scale in owning cattle, or that households with larger herds cannot afford to adequately care for their animals (Figure 4.6.2.6)

---

[19] Male headed households spend on average 2,832.9 NAD and female headed households spend on average 2,131. 5 NAD; Male headed households spend on average 131.6 per head of cattle while female headed households spend on average 191.7 NAD per head of cattle.

**Figure 4.6.2.5: Percent of Households that Spend Money on their Cattle by Herd Size**
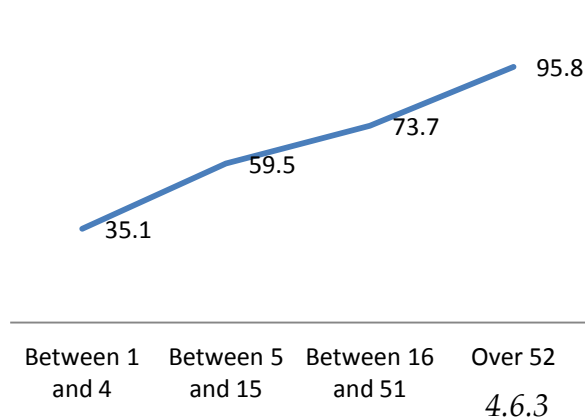
**Figure 4.6.2.6: Average Amount Spent per Head of Cattle by Households that Spent Money on Cattle in the Past 12 Months**



*4.6.3*
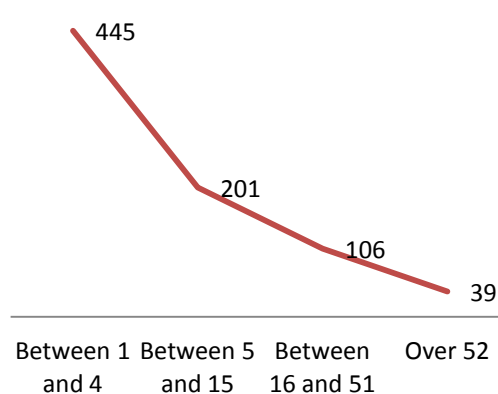
### 4.6.3    Objectives and Challenges for Livestock Owners

When asked what their primary objectives are for livestock owning, farmers cite milk (26.7%), draft power/ploughing (16.8%), and cash income (16.2%). Social reasons are only given by about 9.2% of the sample.

When looking at cattle owning households, the top three reasons remain the same, milk (30.4%), draft power/ploughing (20.3%), and cash income (16.3%). Social reasons increase by 1%. There is a significant decrease in households that list "meat" as their primary objective.[20]

For female headed cattle owning households, the top three primary reasons for owning cattle are the same as the general sample, though more households site milk and draft power/ploughing as their primary objective for cattle ownership and less are recorded cash income (Figure 4.6.3.1).  More male headed households list both cash income and social reasons and their primary objectives for owning cattle (Figure 4.6.3.2).

---

[20] 13.6% of livestock owning households list meat as their primary objective, but only 7.3 % of cattle owning households list meat as their primary objective.

**Figure 4.6.3.1: Primary Reasons for Owning Cattle by Female Headed Cattle Owning Households**[21]



- Milk
- Draft Power/Ploughing
- None
- Dung/Fertilizer
- Meat
- Cash Income
- Money/Capital Storage
- Transportation for Water
- Social Reasons
- Other
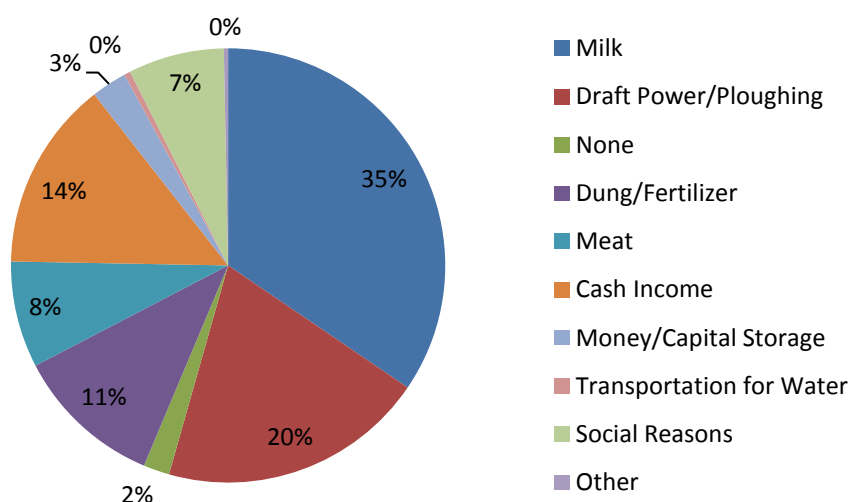
**Figure 4.6.3.2: Primary Reason for Owning Cattle by Male Headed Cattle Owning Households.** [22]



- Milk
- Draft Power/Ploughing
- None
- Dung/Fertilizer
- Meat
- Cash Income
- Money/Capital Storage
- Transportation for Water
- Social Reasons
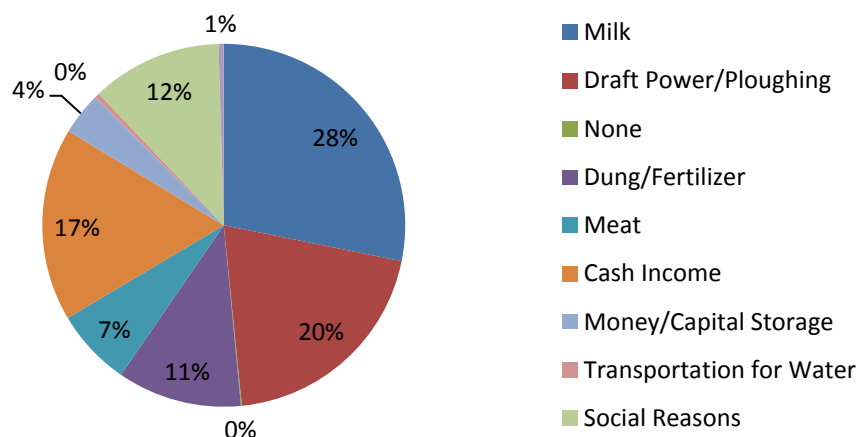
As herd size increases, cash income and social reasons become more common objectives for cattle ownership. This suggests that households who own larger herds are either more market oriented or more traditionally focused than those with smaller herds. Milk remains a common reason for cattle ownership regardless of herd size, while draft

---

[21] "Transportation for Water" and "Other" are 0.47% and 0.32% respectively, not zero as the graph indicates.

[22] "Transportation for Water" is 0.45%, not 0% as the graph indicates.

power and ploughing decreases from around 20% to 8% once herd size goes above 51 cattle. A similar trend, though less dramatic, can be seen with uses of dung/fertilizer, suggesting that secondary by-products become less important as farmers accumulate more animals (See Figure 4.6.3.3).

**Figure 4.6.3.3: Primary Reason for Owning Cattle by Herd Size**
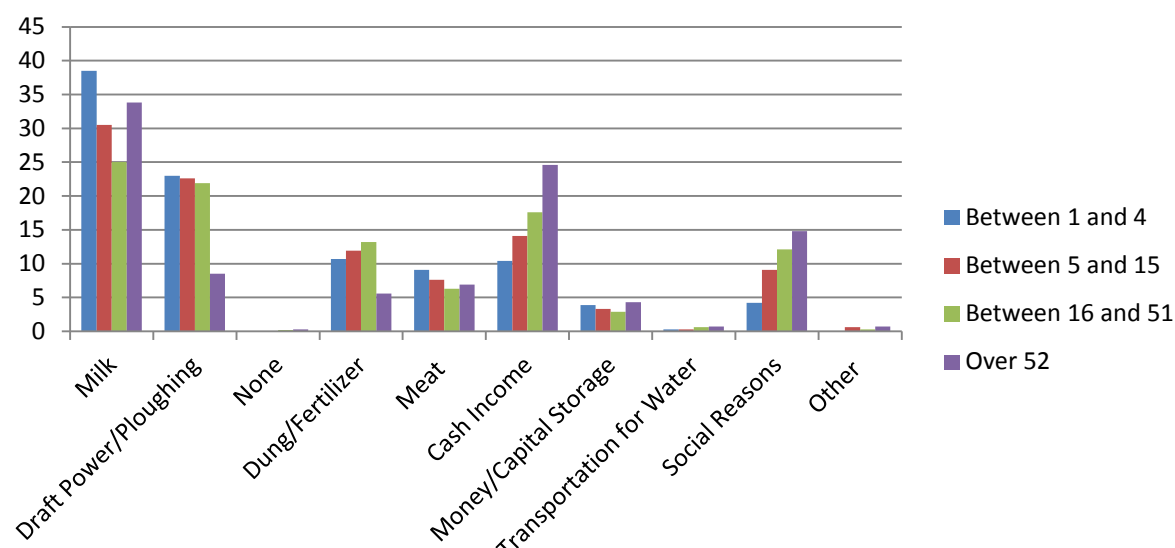


(See Appendix A for breakdown by region.)

The primary challenges for cattle owning household include disease (34.36%), theft (18.36%), predators (11.33%), and drought (11.6%). Only 27.2% of farmers, however, seek veterinary services when their cattle are sick, with 34.8% never seeking veterinary attention for their cattle. Without more information, it is not possible to tell if the market failure is supply (no available veterinary services) or demand (farmers do not have adequate income or desire to seek veterinary services) side oriented.[23]

Challenges for cattle owning households do not differ significantly between male and female headed households. Female headed households cite drought as a larger challenge while male headed households focus more on disease (Figure 4.6.3.5). Male headed households also take their animals to the vet more often when they are ill. This suggests that perhaps both resources and willingness on the part of the farmers contribute to the frequency with which cattle receive veterinary care for illness.

---

[23] Challenges are almost identical for livestock owning households, with 35.45% of households listing disease as their primary challenge, followed by theft (18.1%), predators (11.8%), and drought (11.5%). 1% more cattle owning households, however, list price/lack of water as their primary challenge.

**Figure 4.6.3.5: Primary Challenges for Male and Female Headed Cattle Owning Households**
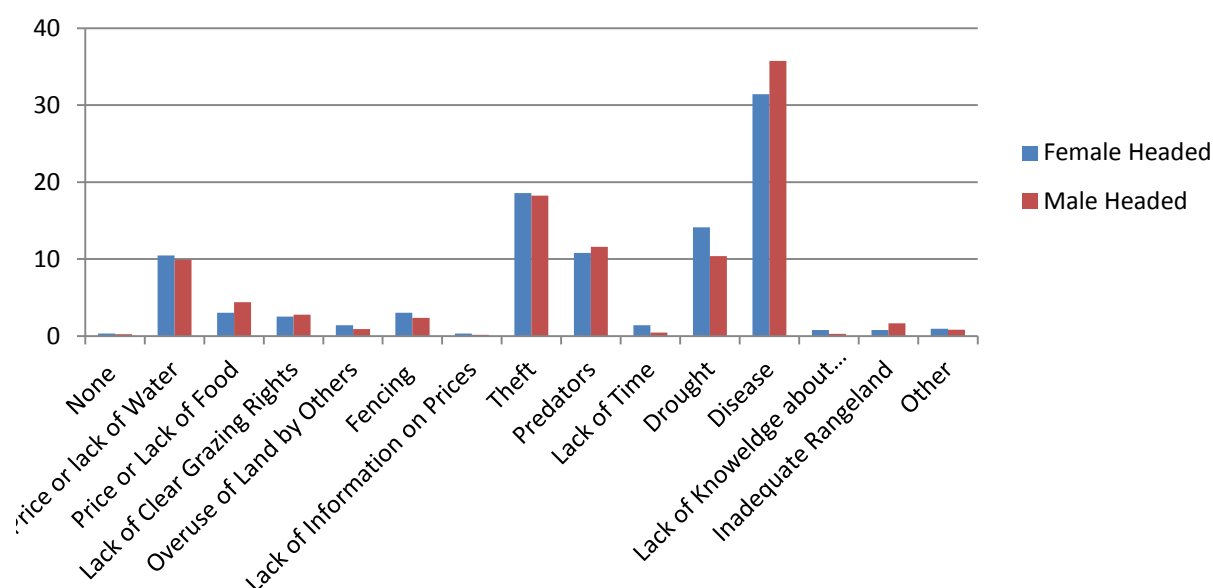


Disease continues to be the primary challenge faced by cattle owners across all 6 regions with the exception of Kunene where theft is reported as the primary challenge. In regions such as Ohangwena where bush encroachment has been a challenge for planned grazing, 7.4% of households cite lack of food as the primary challenge for their cattle. While this is the highest proportion in the six regions, it still ranks low on the list of challenges for households in this area. Similarly, lack of water, another major challenge in implementing planned grazing across the regions, ranks relatively low among the challenges recorded (Figure 4.3.6).

**Figure 4.6.3.6: Primary Challenges for Cattle Owning Households by Region**
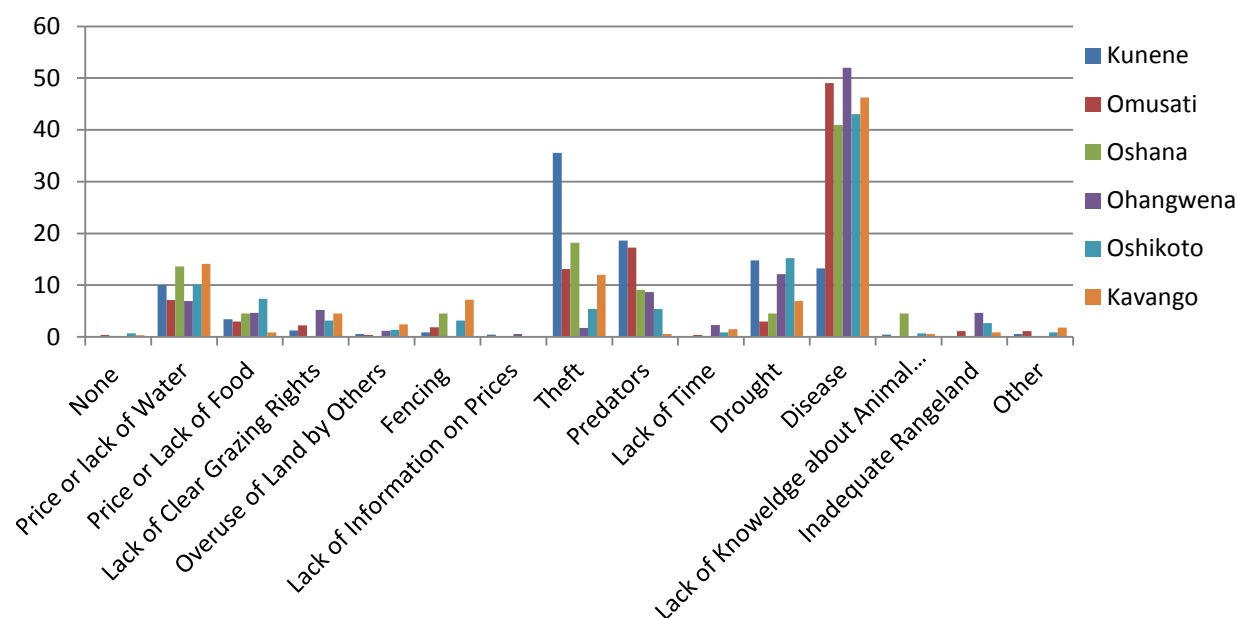


Challenges facing cattle owners do not differ greatly by herd size, though lack of water appears to be a bigger problem for herds over 15 cattle, while lack of fodder becomes less important as herd size increases. (Figure 4.6.3.7).

**Figure 4.6.3.7: Challenges Facing Cattle Owners by Herd Size**
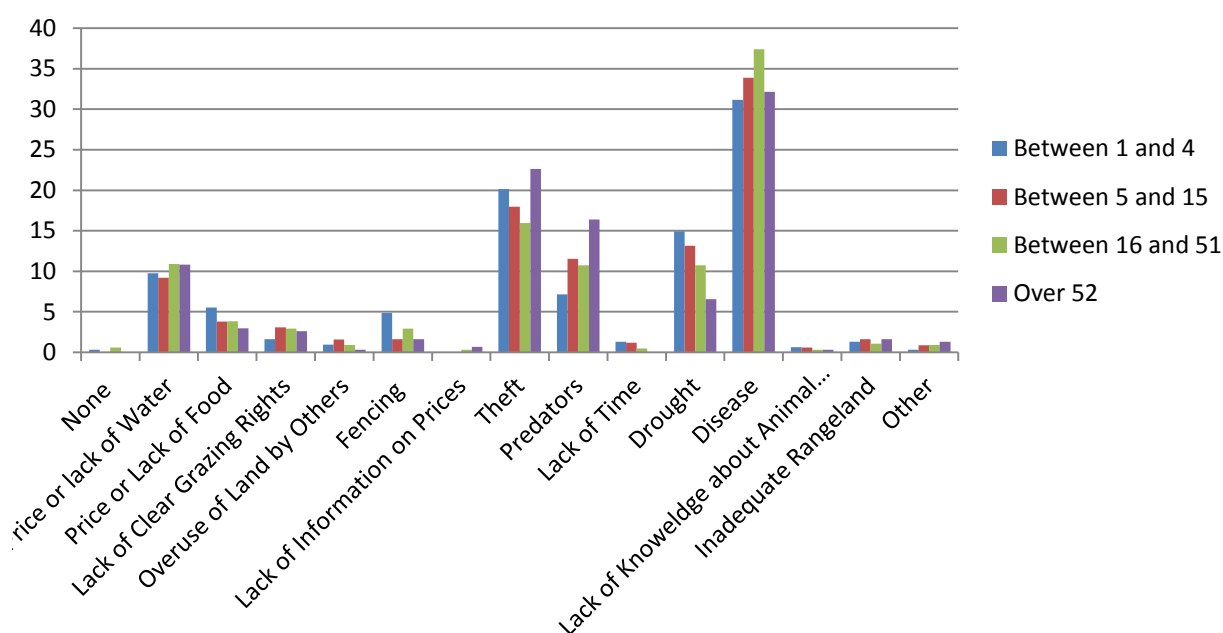
In the past twelve months, farmers experienced 1.8 months during which there was not enough water for their animals. During the dry season, most households rely on boreholes when water becomes scare, while during the wet season, surface water supplies most households needs. Fodder was scare for about 2 months of the past 12 months according to farmers in our sample. The relative scarcity of water and fodder varied by region, with lack of water and lack of fodder being a larger problem in Ohangwena and Oshikoto (See Figures 4.6.3.8 and 4.6.3.9).

**4.6.3.8: Months without Water by Region**

| Region | Value |
|--------|-------|
| Kavango | 1.54 |
| Oshikoto | 2.02 |
| Ohangwena | 3.10 |
| Oshana | 0.31 |
| Omusati | 1.13 |
| Kunene | 1.79 |
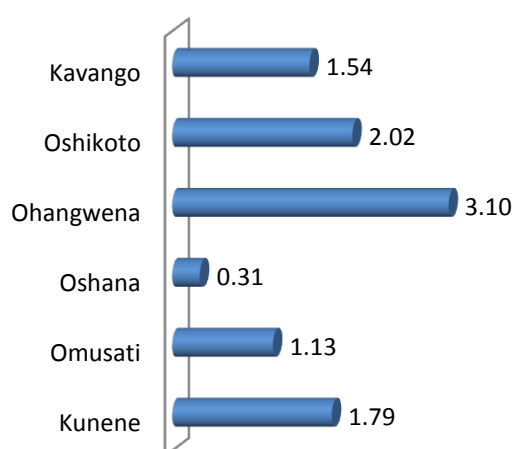
**4.6.3.9 Months with Fodder by Region**

| Region | Value |
|--------|-------|
| Kavango | 0.6 |
| Oshikoto | 3.71 |
| Ohangwena | 4.85 |
| Oshana | 1.17 |
| Omusati | 0.96 |
| Kunene | 1.56 |
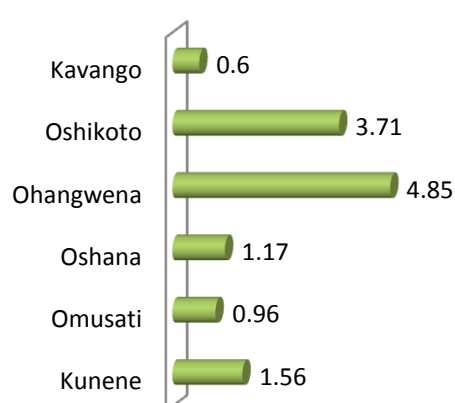
*4.6.4    Other Livestock Ownership*

Though cattle are important to farmers in the NCAs for social reasons, other livestock form the backbone of household welfare through consumption and sale. Ninety one percent of our sample is livestock owning, with poultry and goats being the most common animal owned (See Figure 4.6.4.1).[24] While only 13% of households own sheep, they form the second largest herd size, with around 14 sheep per sheep owning household.

---

[24] As noted in cattle ownership, farmers may report the number of livestock owned inaccurately for social reasons (they don't want people to know how many animals they have so they underreport or overreport) or because they believe they will gain something from a project or programme if they underreport the number of animals they have.

**Figure 4.6.4.1: Portion of Households that Own Different Livestock**
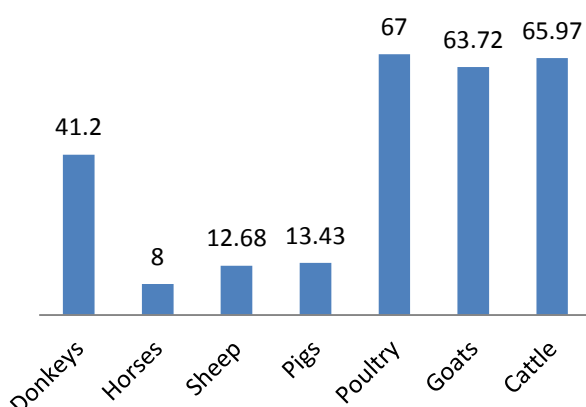
**Figure 4.6.4.2: Average Size of Herds**
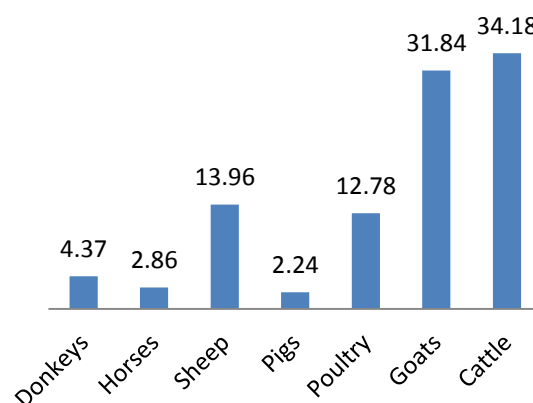


Type of livestock owned differs slightly by region. Households in all regions own poultry, however, poultry and pig owning households are fewer in Kunene. There is only one sheep owning household in Kavango and there are no horse owning households in Oshana. Horses are primarily owned in Kunene and sheep in Oshana, Omusati, and Kunene (See Figure 4.6.4.3). Herd size also varies slightly between region (See Figure 4.6.4.4).[25]

**Figure 4.6.4.3: Portion of Households that Own Livestock by Region**
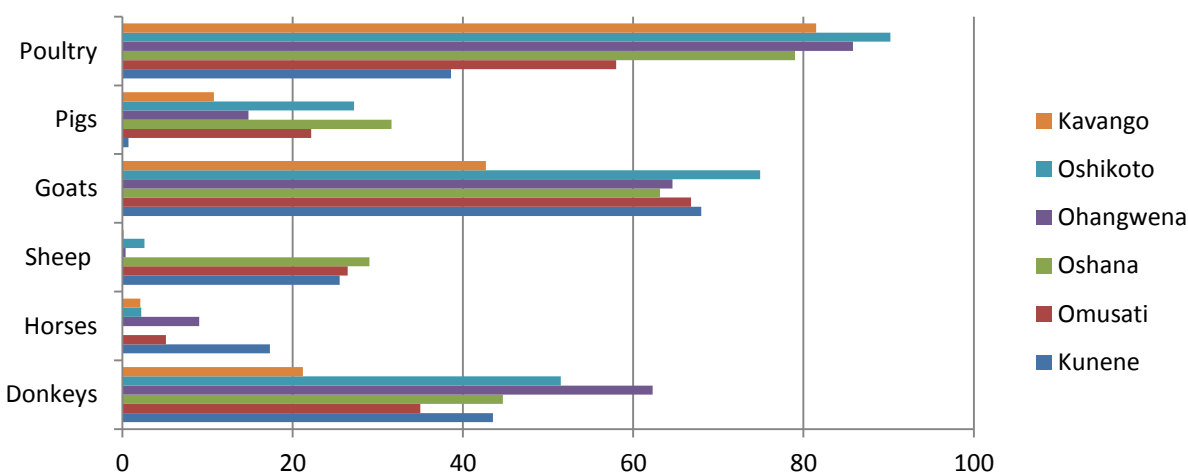


**Figure 4.6.4.4: Size of Herds by Region**

---

[25] It appears as if the largest herds of sheep are found in Kavango, however, as noted above, there is only one households that owns sheep in Kavango, thus accounting for this anomaly.
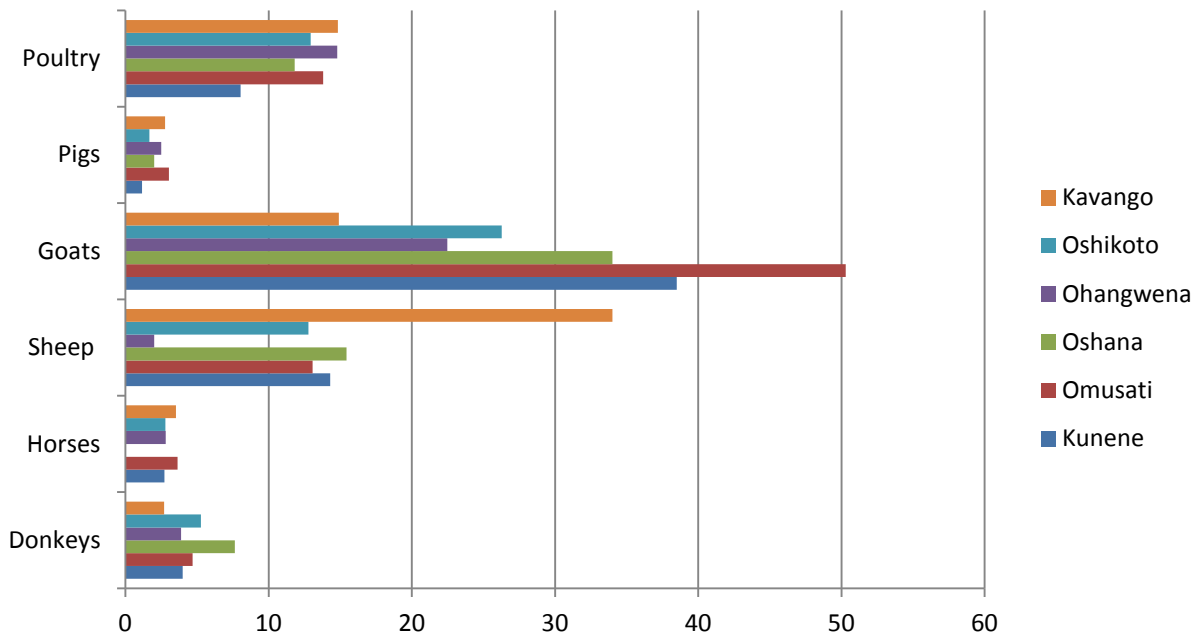
Male headed households more commonly own livestock than female headed households with the exception of pigs which are owned in slightly larger percentage by female headed households. Poultry is owned in almost equal percentages by male and female headed households (Figure 4.6.4.5). Even in cases where a larger percentage of female headed households owned animals, male headed households held animals in larger numbers for each type of animal recorded in our sample (Figure 4.6.4.6).

**Figure 4.6.4.5: Percent of Households that Own Livestock by Gender of Head of Household**
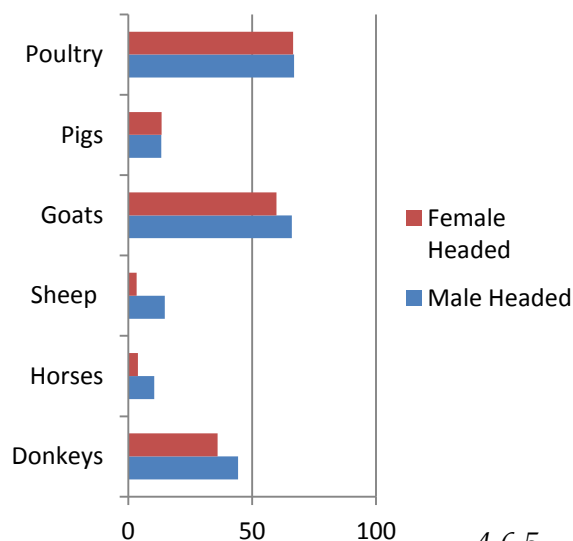
**Figure 4.6.4.6: Herd Size by Gender of Household Head**
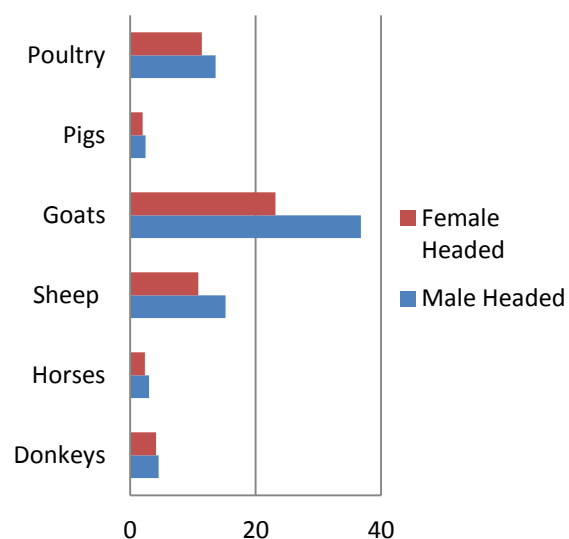




*4.6.5    Gender Dynamics of Livestock Care*

Perceived gender roles in the NCAs assign cattle management to men and small stock management, such as poultry, to women. In the CBRLM Household Income and Expenditure Survey, the primary caregiver in the household for cattle is identified as male for 82% of cattle owning households. Care of donkeys, horses, sheep, and goats are all male dominated, whereas primary care of poultry and pigs are assigned to women (See Figure 4.6.5.1). Secondary and tertiary caregivers for poultry and pigs are also majority women.

**Figure 4.6.5.1 Gender of Caregivers for Poultry and Pigs**
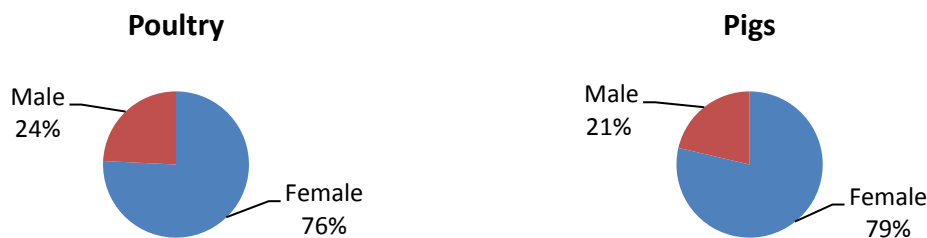


### 4.6.6   Animal By-products

The sale of animal by-products, such as eggs, dairy fat, milk, and skins offer a potential supplementary income source for livestock owning household. Most households in the sample, however did not sell by-products. The 4.8% of households that sold poultry by-products in the past 12 months received, on average, 70 NAD. Though only 3.8% of cattle owning households sold animal by-products, households that sold received an average of 943 NAD in the past 12 months.

Paralleling the gender trends of the caretakers of livestock, household members in charge of selling cattle by-products were majority male, while the household members in charge of selling poultry by-products were majority female. Secondary and tertiary sellers of poultry by-products were split closer to 50/50, male and female.

### 4.6.7   Training

In order to determine potential overlap with other training programmes offering similar information to the CBRLM programme, households were asked if they had received any training on livestock care, rangeland management, or business practices in the past 12 months. Only 2% of household in our sample admitted to receiving any training over the past year. The data indicates that reaching these households could provide a

relatively large impact if they have in fact been previously unaffected by livestock training programmes.

Those entities that provided training in rangeland management include the Ministry of Agriculture, affiliates of the University of Namibia, IRDNC, the Red Cross, Namibia National Farmers Union, MEATCO, Agri, and GOPA. Livestock training was undertaken by similar entities (24 households in the sample received training in two or more subjects by the same organization) with the addition of various veterinary services. Business and marketing skills were offered by the Ministry of Agriculture, Water & Forestry, the Ministry of Trade and Industry, IRDNC, the Kohi Yomuti project, an SME project, as well as the Namibian Farmers Union. Seventy-five percent of those that receive training report that they apply the training they receive. Though self-reported statistics such as these are often unreliable, one can hypothesize that the challenge resides in access to programmes rather than getting households to utilize the skills they have learned. While there seems to be a lack of training in general among households in the sample, there is an especial lack of training in business and/or marketing skills (See Figure 4.6.7.1).

**Figure 4.6.7.1 Number of Households that Received Training in the Past 12 months**
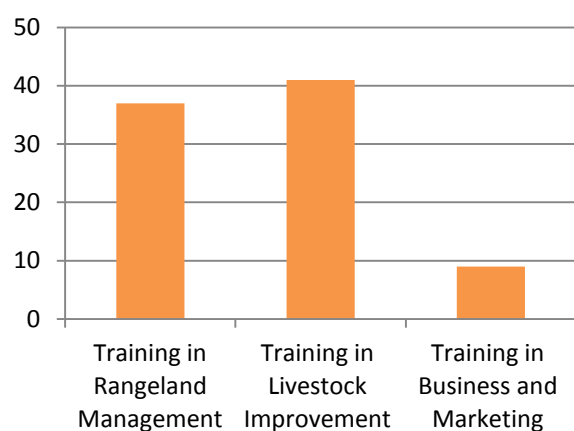


## 4.7    *Expenditures*

A measure of total yearly expenditures was generated using the components:

- Weekly expenditures on food, alcohol, cigarettes, non food items and cell credit

- Expenditures on   fuel, water, clothes and shoes, ceremonial expenses, transportation, vehicle purchase/repair, school fees and expenses, bank fees/ financial services, furniture, household appliances, house maintenance,

mobile/cellular phones, health expenses, and other major expenses in the past 12 months

- Expenditures on care of livestock (cattle and other) in the past 12 months

- Expenditures on purchase of livestock in the past 12 months

Weekly expenses were multiplied by 52 to estimate amount spent on the listed household items in a year.

**Figure 4.7.1 Average Weekly Expenditures[26]**

| Item | Average Amount Spent Per Week (NAD) |
|------|:-----------------------------------:|
| **Food** | 124.5[27] |
| **Alcohol** | 14.0[28] |
| **Cigarettes** | 6.4 |
| **Non-food items** | 39.5 |
| **Cell Credit** | 18.2 |

Average annual household expenditure is calculated at 21,504.6 NAD. This falls significantly below the NHIES 2009/2010 calculations of 40,589 NAD in average annual household consumption for rural areas. The NHIES aggregate includes measure of imputed rent for free occupied and owner occupied dwelling, which may bias the difference upward. However, it is unlikely that this would close the 20,000 NAD per year consumption gap. The NHIES 2009/2010 also calculates daily consumption through the use of a Daily Record Book, which can offer a more precise calculation of daily consumption. Average annual household income in the NHIES data, calculated as a total of consumption and non-consumption expenditures, is 42,893 NAD, also significantly above the CBRLM average expenditure and income measures.

It is important to note that even where the NHIES data is able to break down the population by "urban" and "rural", the rural NHIES sample and the CBRLM sample are not identical. Additionally, wealth in terms of cattle/livestock ownership and

---

[26] Although expenditure data is often more accurate than income data, thus counting for the discrepancy between average household income and expenditure (a negative savings), it is also possible that the weekly expenditure measures overstate the amount households spend in a week as respondent extrapolate to a week where they purchased items, which may only occur once a months.

[27] Outlier of 26595 was dropped

[28] Outlier of 15,000 was dropped

monetary measures are not necessarily relative The CBRLM expenditure measures looks at cash and/or in kind consumption of goods outside of the home. This does not account for consumption of home produced items such as meat or milk from animals, crop consumption, clothing production, or the relative "wealth" value derived from livestock holdings.

Average annual household expenditure (CBRLM) is lower than annual consumption (NHIES) in each region and the same trends by region do not hold. The Annual household income from the NHIES 2009/2010 survey mirrors annual household consumption (Figure 4.7.2). The sample size for the Oshana region in the CBRLM survey was low due to flooding in the area, which may account for the low expenditure average. If we exclude non-cattle owning households, Oshana becomes the region with the highest average annual expenditure. Looking solely at cattle owning households, the CBRLM data mirrors the NHIES data for the three regions with the highest expenditures, however the averages for each region are still lower that the NHIES numbers (Figure 4.7.3).

**Figure 4.7.2: NHIES Average Annual Household Consumption versus CBRLM Average Annual Household Expenditure by Region**
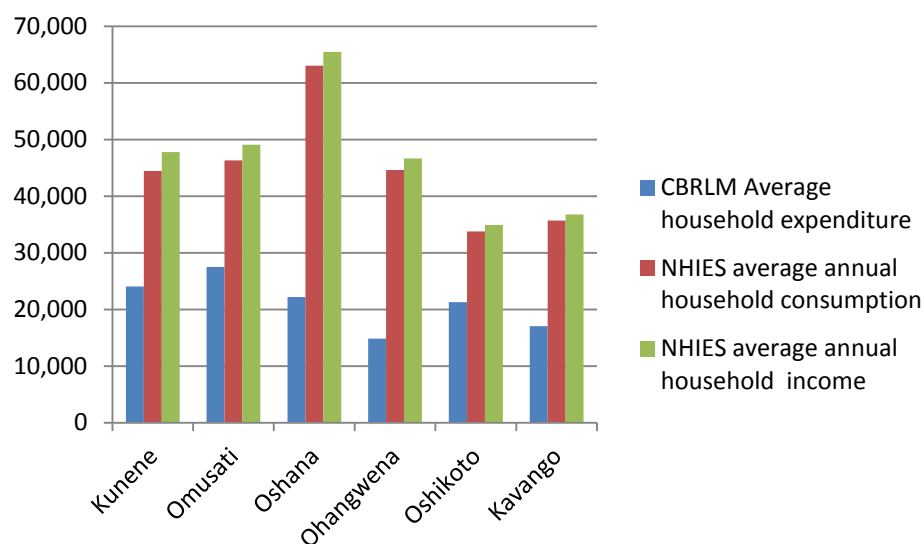


**Figure 4.7.3: NHIES data on Income and Consumption compared to CBRLM Average Annual Expenditure for Cattle Owning Households**
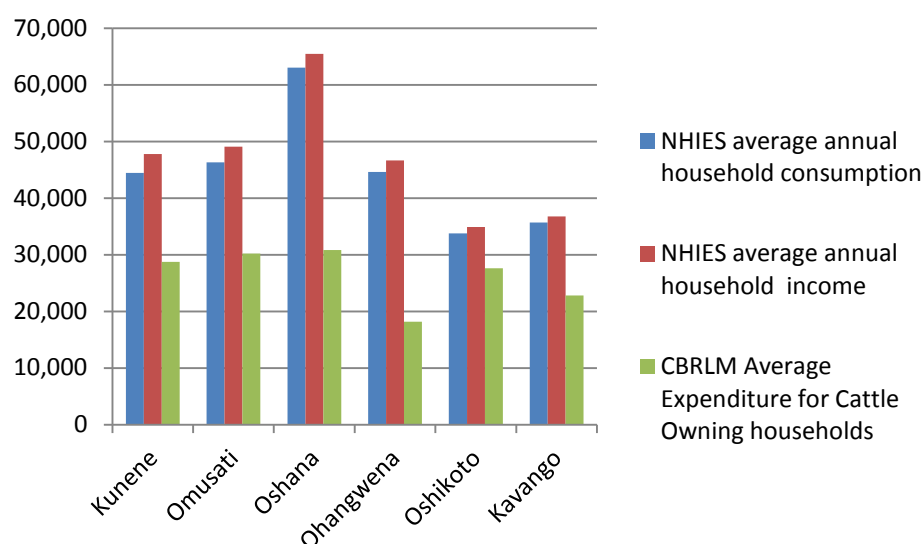
When breaking out likely cattle posts from the sample, the mean annual household expenditures increase to 22,160 NAD.

Over the course of year, households in our sample face adverse shocks to income. While some of these costs are unforeseen such as payments for funerals or other celebrations and health expenses, the data shows that the majority of income shocks experienced by the households in our sample can be anticipated and planned for by smoothing either their income or consumption over a 12-month period.

The most common expenses households pay for during the course of a year are water, clothes, transportation, school fees, and health expenses. Though the majority of our sample pays for water and health expenses, the average amount they spent on these resources, 407 NAD and 245 NAD, are fairly low when compared to the amounts spent on household goods each week (Figure 4.7.5).[29] School fees represent a larger and more consistent shock to income, effecting 63% of the sample. Average amount paid in school fees is 837 NAD with a median of 120 NAD. While ceremonial expenses do not affect the majority of households, those that do pay 1,524 NAD per year.[30]

Though only 18% of households in our sample have members earning income outside of the household, household have other methods of income smoothing through pension payments, remittances, small business ownership, and various grants.
Training in financial management (which our data tells us is not occurring) could offer an improvement in household wellbeing. With low savings and almost no borrowing,

---

[29] The median amount spent on water is 0.00 while the median amount spent on health expenses is 46.00

[30] Ceremonial expenses do not take into account livestock slaughtered for such events or other non-monetary inputs.

one can posit that livestock act as a type of savings mechanism for households. The data, however, shows that cattle are a rather illiquid asset either through poor financial planning on the part of the households or lack of access to appropriate buyers and subsequent savings mechanisms on the market side. Through training in financial management, improved access to markets, and/or better savings mechanisms, it stands to reason that the wellbeing of households in the sample could be improved without needing to increase their current store of assets.

**Figure 4.7.4: Expenses in Over Last Twelve Months**



Fuel — Yes 25%, No 75%

Water — Yes 49%, No 51%

Clothes/Shoes — Yes 74%, No 26%

Ceremonial Expenses — Yes 36%, No 64%

Transport — Yes 58%, No 42%

Vehicle — Yes 5%, No 95%

School Fees — No 37%, Yes 63%

School Expenses — Yes 32%, No 68%

Bank Fees — Yes 15%, No 85%

Furniture — Yes 13%, No 87%

Appliances — Yes 23%, No 77%

House Maintenance — Yes 8%, No 92%

Mobile Phone — Yes 26%, No 74%

Health Expenses — No 25%, Yes 75%

Other — Yes 7%, No 93%
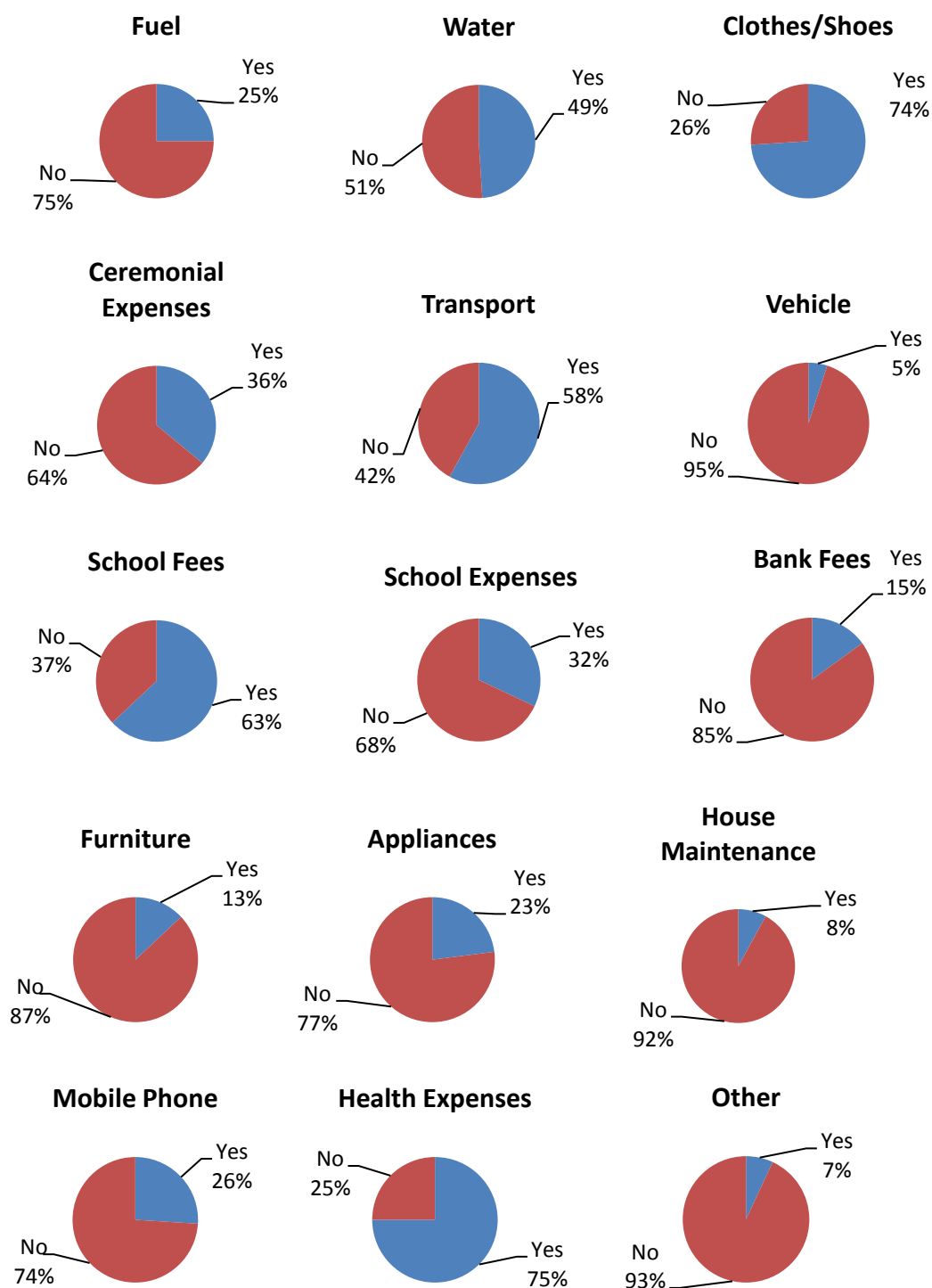
**Figure 4.7.5: Amount Spent on Yearly Expenditures**

| Item | Average Amount spent per year by sample (NAD) | Amount Spent Per Year by those who spend (NAD) | Observations |
|---|---|---|---|
| Fuel | 689.3 | 1378[31] | 751 |
| Water | 407.2 | 834 | 1447 |
| Clothes and Shoes | 739.0 | 1005 | 2180 |
| Ceremonial Expenses | 549.7 | 1525 | 1069 |
| Transportation Services | 395.6 | 681 | 1723 |
| Vehicle Purchase/Repair | 1203.0 | 23779 | 150 |
| School Fees | 837.4 | 1331 | 1865 |
| School Expenses | 223.9 | 695 | 995 |
| Bank Fees and Financial Services | 138.1 | 985 | 415 |
| Furniture | 206.7 | 1543 | 397 |
| Household and Kitchen Appliances | 155.2 | 672 | 685 |
| House Maintenance | 164.3 | 2115 | 226 |
| Cellular Phone purchase and repair | 136.7 | 533 | 760 |
| Health Insurance/Expenses | 245.1 | 326.3 | 2227 |
| Other Major Expenses 1[32] | 1.2 | 382 | 9 |
| Other Major Expenses 2 | 0.3 | 900 | 1 |
| Other Major Expenses 3 | 0 | 0 | 0 |

The most commonly owned assets among households in our sample are cellular phones (65.4%), radios (57.8%), and other tools (66.8%). There is a little over one cell phone per household in our sample. Automobiles ownership is rare, only 5.4 % of the sample owns a car. Animal drawn carts are more common (16.2%), especially in Oshana and Oshikoto where 47% and 23% of the sample respectively own animal drawn carts.[33]

## 4.8    POVERTY INDEX

The issue of measuring levels of poverty amongst specific populations, relative or absolute, is a task that continues to plague economists and statisticians. The multidimensional nature of poverty and the difficulty of extrapolating one measure across many different cultural and political settings pose a challenge for undertaking an accurate welfare analysis. Recently, a growing consensus has arisen around using consumption aggregates to measure poverty and compare relative levels amongst

---

[31] Outliers of 160000 and 864000 NAD

[32] Other major expenses include : orchard planting, wire for school fence, blankets, and hired help

[33] Oshana is the smaller region in our sample both geographically and in terms of population. While 47% of the households interviewed own an animal drawn cart, only 18 households completed households out of 38 in the CBRLM sample own animal drawn carts.

heterogeneous populations (Deaton and Zaidi, 3). In the following section a poverty index for the CBRLM sample will be constructed using Deaton and Zaidi's *Guidelines for Constructing Consumption Aggregates for Welfare Analysis* and the World Bank's guidelines for poverty levels. Due to a lack of similar poverty analyses for Namibia and missing information on housing rents and non-purchased food consumption, the analysis will focus on comparing relative levels of poverty within the sample from a consumption standpoint.

In Section 4.5, an aggregate measure was constructed for income, why not utilize the income data to measure poverty? Though income provides a good measure of relative welfare over a long period, say a lifetime, consumption often provides a better measure of welfare when the time period in question is shorter, such as a year in the CBRLM Household and Income Survey. Household income surveys, like the CBRLM instrument, seek to capture the general wellbeing of a population rather than fluctuations in welfare due to seasonal or one-off shocks. Consumption is more easily smoothed over these types of income shocks, giving a longer term picture of standard of living. This is especially true in rural, agriculture communities like the ones the CBRLM programme works with that are more prone to seasonal fluctuations. Additionally, it is often more difficult to collect accurate income data than accurate consumption information, especially when inflows come primarily from informal employment. Respondents in difficult areas may also seek to understate income as a way to increase their chances of receiving government programmes (Deaton, 14).

As households may hold the majority of their valuable assets in livestock, another option would be to look at wealth as a measure of household wellbeing. As current NHIES data relies on consumption measures of income and expenditure to define relative poverty and MCC utilizes a consumption oriented poverty index, it seemed most reasonable to construct these measures for both in-country and international comparison. The "Cattle Assessment" will also offer the opportunity to measure changes in herd size, composition, and size of cattle holding. This data will allow IPA to measure changes in the quantity and quality of cattle holdings as well as changes to monetary inflows.

A poverty index was constructing in 2005 prices using various consumption measures from the CBRLM Household Income Survey and the guidelines provided by Deaton and Zaid in their 2002 paper.

*Household Weights*

In order to analyze poverty on a per capita basis, weights first had to be created for the household. Using the Namibian Central Bureau of Statistics 2008 *Review of Poverty and Inequality in Namibia*, a weight of 0.5 was assigned to children under the age of 5; 0.75 to children between the ages of 5 and 16; and 1 to persons over the age of 16. To control for

economies of scale, the weight assigned to the household was raised to 0.9 as suggested by Deaton and Zaidi for poorer, agricultural economies where the majority of consumption expenditure go to food stuffs (Deaton and Zaidi 52).

*Consumption Measures*
The consumption measures used in constructing this poverty index were:

- Amount spent on transportation
- Amount spent on clothes and food
- Amount spent on school fees
- Amount spent on health expenses
- Amount spent on household maintenance
- Amount spent on food
- Amount spent on non food items[34]
- Value of cell phones owned by the household
- Value of radios owned by the household

To calculate the daily value of durables (cell phones and radio) the current total value was multiplied by (prime rate- inflation + depreciation).[35] All consumption measures were converted from their recorded time period (week or year) into days by dividing by the appropriate unit. Please note that housing and consumption of home produced food stuffs was not included in the index due to lack of reliable information on prices and problems with unit conversion.

*Index*
In order to assess the consumption measures at a 2005 level, per the World Bank standard, 2011 consumption in 2011 prices had to be converted to 2011 consumption in 2005 prices using the Consumer Price Indexes from 2005 and 2011.[36] Next, 2011 consumption at 2005 prices had to be converted \ into 2005 Purchasing Power Parity US Dollars. The resulting variable was then divided by the household weight to generate an index of per capita consumption at 2005 USD prices. The results of that index, broken down by World Bank poverty levels can be found below:

---

[34] This was a weekly expenditure whose examples included toiletry items like soap or goods such as oil or paraffin.
[35] Values for Namibia were a prime rate of 0.0975; inflation at 0.045 and depreciation at 0.15
[36] CPI 2005: 114 (http://data.un.org/CountryProfile.aspx?crName=Namibia); CPI 2010: 180 (http://www.npc.gov.na/cbs/cpinews/Table_3.pdf )

**Figure 4.8.1: CBRLM Population by Poverty Categories**

| Poverty Category | Per Capita Daily Consumption (PPP Adjusted) | Percent Households |
|---|---|---|
| Extremely Poor | < $1.25 | 17.00% |
| Poor | < $2 | 22.29% |
| Near Poor | $2-$4 | 10.35% |
| Not Poor | >$4 | %67.35 |

The majority share of expenditures of households in our sample goes to food purchased outside the home and other weekly expenditures (Figure 4.8.2). This breakdown of expenditure follows a similar trend to the poverty categorization in the 2008 *Review of Poverty and Inequality in Namibia*, which looks at poverty levels as a percentage of consumption spent on food consumption.

**Figure 4.8.2: Breakdown of Poverty Index by Category**



Legend:
- p 50 of b_yrvaluetr_adj
- p 50 of b_yrvaluecl_adj
- p 50 of b_yrvaluesc_adj
- p 50 of b_yrvaluehe_adj
- p 50 of b_yrvaluema_adj
- p 50 of b_valuecell_adj
- p 50 of b_wkfood_adj
- p 50 of b_wknfood_adj
- p 50 of b_valuerad_adj
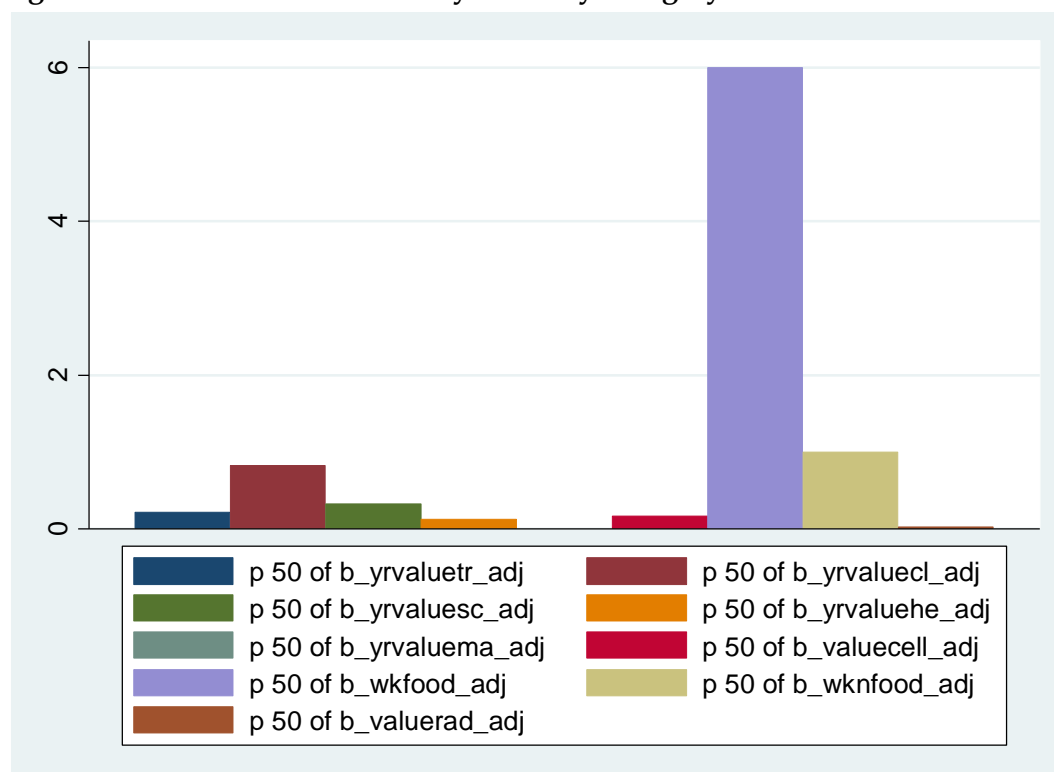
We also find that 18.36% of female headed households are classified as "extremely poor" compared to 16.17% of male headed households, and 23.8% of female headed households classified as "poor" compared to 21.4% of male headed households. There is no real difference between male and female headed households for the classification of "near poor".

The highest incidence of extremely poor households are found in Omusati with 21.66% of households consuming less than 1.25 USD per person per day, followed by Kavango with 19.62%. However, when you remove "likely cattle posts" from the sample, Kavango has a larger rate of extreme poverty at 19.39% versus Omusati's 18.41%. The highest percentage of not poor households are found in Kunene with 73.94% of households followed by Oshana with 68.42% and Oshikoto with 67.43% (Figure 4.8.3).

**Figure 4.8.3: Poverty Levels by Region**
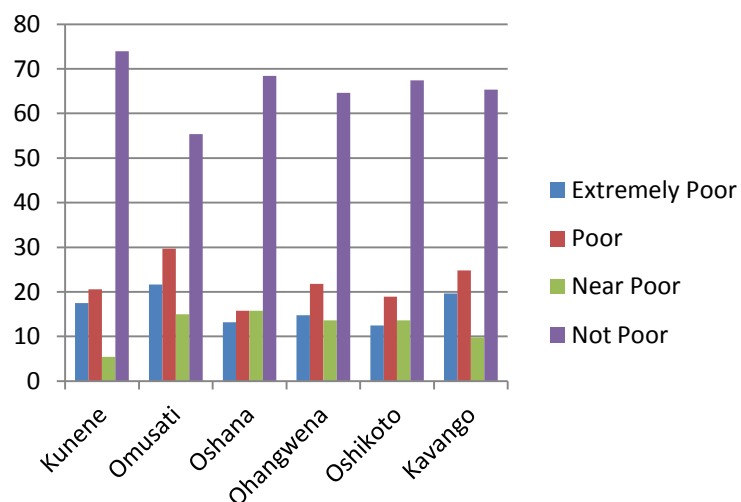


As noted in Section 4.5, whether or not household members have jobs outside of the home has a large effect on income levels, with wealthier households having some form of salaried employment. The same holds true for consumption levels. A larger percentage of extremely poor and poor households lack jobs outside of the homestead (Figure 4.8.4).

**Figure 4.8.4: Poverty Levels by Salaried Employment**
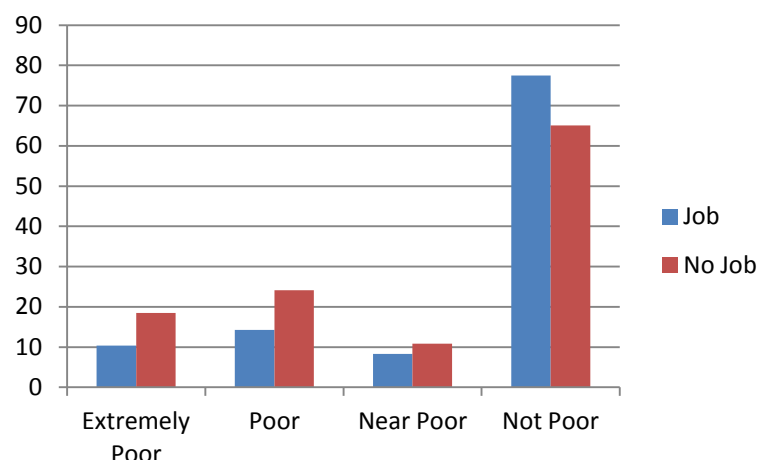


Households that own cattle are generally less poor (higher percentage of not poor households) than the rest of the sample. Households that grow crops have a slightly higher percentage of poor and extremely poor households than the full sample, whereas households without livestock see much higher percentages of poor and severely poor households at 37.88% and 44.7% respectively (Figure 4.8.5).

**Figure 4.8.5: Poverty Index by Agricultural Assets**
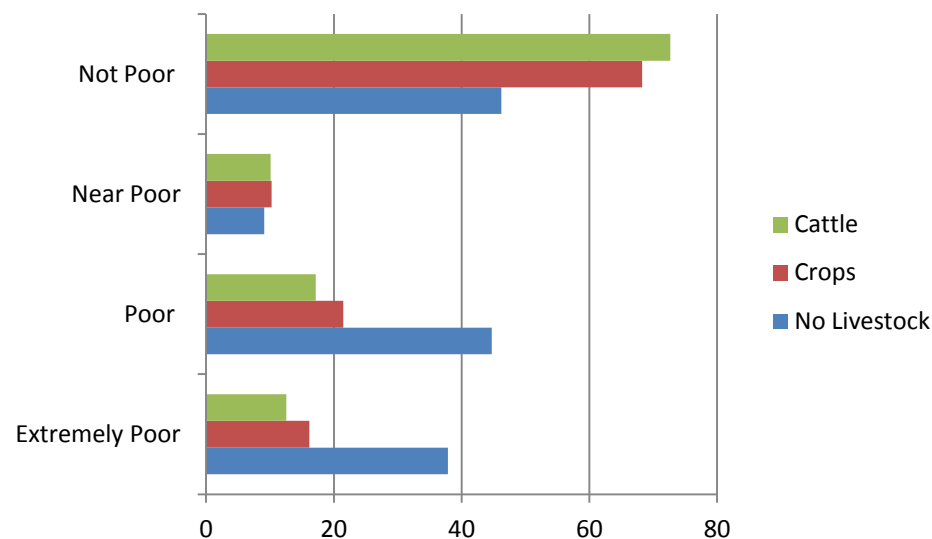


Cattle posts that have been recorded as households have the potential to overstate the number of extremely poor and poor households in our sample. In Figure 4.8.6 one can see that there are indeed significantly more extremely poor and poor "likely cattle posts" than "households" even on a per capita basis where the small size of "cattle posts" could skew the estimate upwards.

**Figure 4.8.6: Poverty Index of Possible Cattle Posts**

| Poverty Category | Per Capita Daily Consumption (PPP Adjusted) | Percent Households |
|---|---|---|
| Extremely Poor | < $1.25 | 27.44% |
| Poor | < $2 | 35.38% |
| Near Poor | $2-$4 | 13.59% |
| Not Poor | >$4 | 51.03% |

## 4.9    Crops and Food Security

Though crops production is not directly a part of the CBRLM intervention, it forms an important part of life in the NCAs. Crop production helps to feed the household as well as provide a secondary source of income. As such, changes to livestock farming may have an impact on crop production. If household income were to increase through the CBRLM intervention, farmers might supplement their diets through outside purchases and reduce crop production. Conversely, with greater business and marketing acumen, farmers might market more of their produce or diversify their plantings.

Eighty percent of farmers in our sample engage in crop production. Eighty-two percent of households that own livestock also produce crops, while only 63% of non-livestock owning households produce crops. Crop production therefore, seems to be complementary to livestock ownership rather than supplementary. Of those household who grow crops, however, only around 16% (or 344 households) generated income from the harvest of those crops, supporting the perception of crop production as existing for consumption rather than income generation.

The most commonly produced crop is mahangu, however, the types of crops produced vary slightly by region (See Figure 4.9.1).

Households that marketed crops received an average of 1,844 NAD per year in supplementary income, less than both the amount spent caring for cattle as well as the amount generated from the sale of one animal.

**Figure 4.9.1: Crops Produced by Region**

|          | Crop 1  | Crop 2  | Crop 3 |
|----------|---------|---------|--------|
| **Kunene**    | Maize   | Pumpkin | Melon  |
| **Kavango**   | Mahangu | Maize   | Beans  |
| **Omusati**   | Mahangu | Sorghum | Beans  |
| **Oshana**    | Mahangu | Sorghum | Beans  |
| **Ohangwena** | Mahangu | Sorghum | Beans  |
| **Oshikoto**  | Mahangu | Sorghum | Beans  |

The largest proportion of households engaged in crop production can be found in Ohangwena (97.3%). Respondents in Omusati produced the least crops as a percentage of those surveyed; however, the fewest number of respondents marketed crops in Kunene .[37]

Those doing the majority of work on harvesting the crops tend to be slightly more female than male, though the split is close to 50/50. While livestock management or care trends towards one or two primary caretakers within the household, the harvest of crops points to the involvement of a larger portion of the household (Figure 4.9.2).

**Figure 4.9.2: Gender of Household Members Responsible for Harvesting Crops**

| Crop | Female % (Observations) | Male % (observations) |
|------|-------------------------|-----------------------|
| **Crop 1 (Primary Worker)** | 51.65  (1,141) | 48.35 (1,219) |
| **Crop 1 (Secondary Worker)** | 70.25   (1,228) | 29.75 (520) |
| **Crop 1 (Tertiary Worker)** | 48.90  (424) | 51.10 (443) |
| **Crop 2(Primary Worker)** | 51.74  ( 953) | 48.26 (889) |
| **Crop 2 (Secondary Worker)** | 72.48 ( 1,014 ) | 27.52 ( 384) |
| **Crop 2 (Tertiary Worker)** | 49.22 ( 349 ) | 50.78 ( 360) |
| **Crop 3 (Primary Worker)** | 50.39 (723 ) | 47.61 ( 657) |
| **Crop 3 (Secondary Worker)** | 72.59 (789 ) | 27.41 (298 ) |
| **Crop 3 (Tertiary Worker)** | 48.43 ( 277) | 51.57(295 ) |

---

[37] **Percentage of households surveyed that harvested crops in the past year and percentage of crop growing households that sold their harvest in the past year:** Kunene, 70.8 % produce crops and 2.7 % sell ; Kavango, 89.5% produce crops and 15.7% sell ; Omusati, 49.4% produce and 10.3%sell; Oshana 79% produce and 19.3% sell; Ohangwena 97% produce and 64.4% sell ; Oshikoto 95% produce and 22% sell

Though households produce crops and own livestock, all which could serve as potential food sources, a significant number of households in our sample still experience food insecurity. While less than half of our sample either went to bed hungry or went a whole day without eating in the past 12 months (See Figures 4.9.3 and 4.9.4), of those that did experience hunger, a large majority (between 80 and 85 percent) also experienced hunger over the past three months. The CBRLM Household Survey was conducted during the months of April, May, and June, months which coincide with the end of the rainy season in Namibia. The fact that the majority of household that experience hunger over the course of the year did so during the three months prior to the survey suggest that the hunger is persistent rather than seasonal.

**Figure 4.9.3: Percent of Households that Bed Hungry in the Past 12 months**
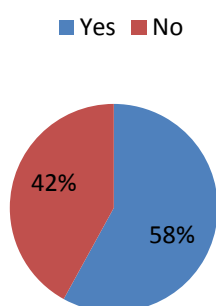
**Figure 4.9.4: Percent of Households that Went to Went a Whole Day without Eating in the Past 12 months**
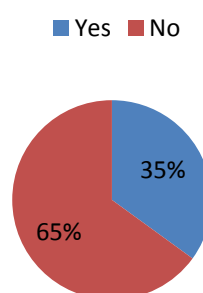




# 5.    Social Cohesion and Behavioural Activities

## 5.1    Introduction

The dual concepts of *shared resources* and *social preferences* are integral to the CBRLM programme.  On the one hand, the programme hopes to convince communities to jointly manage not only the rangeland, but also the business side of resource and herd management.  On the other hand, the intervention takes place in a setting that has well-established trust-based institutions such as informal markets.  Not surprisingly, one's endowments of social preferences – such as trust, reciprocity, altruism, and fairness – are thought to be key determinants of outcomes like productivity and income.  For example, survey-based measures of trust, particularly responses to the question, "Generally speaking, do you think most people can be trusted?" have been used to explain international differences in income levels and rates of economic growth.[38]

---

[38]  Knack and Keefer, 1997; La Porta et al., 1997; Zak and Knack, 2001

Other field studies have found trust to be positively correlated with household income and expenditure.[39] Given all of the above, the analysis plan for the CBRLM evaluation incorporates various measures of social preferences (or social capital), both at the individual- and village-levels, for use as both heterogeneous treatment effect variables and primary outcome variables.

To measure social preferences, we first include a series of behavioural experiments within the household survey. Broadly speaking, the experiments examine individuals' concern with their own economic wellbeing compared to that of their fellow community members. The Public Goods Game involves choosing between a social and an individual benefit. The social benefit can be distributed equally amongst the group or, in an alternate specification, can be allocated by the local chief. The Trust Game involves sacrificing a certain reward for the prospect of a larger, uncertain reward which is at the discretion of an anonymous partner. One key innovation of our experiments is the engagement of the village chief. Specifically, in some specifications of the experiments the village chief has discretion over the allocation of group resources to community members (in the Public Goods Games). Through these specifications of the experiments, we get indications of how much villagers trust their chief to solve collective action problems.

Next, we include attitudinal measures of social cohesion in Section J of the survey instrument. These questions measure individuals' participation in the community, their levels of trust towards other individuals, their levels of altruism, and their attitudes towards risk. (The survey questions also cover household power dynamics.) In keeping with the strategy used by Bouma et al. (2008) in India, we analyse the relationship between these attitudinal measures of social cohesion and our experimental measures of social preferences. Once the endline data is collected, we will broaden our analysis to look at the relationship between both these attitudinal and experimental measures and the main outcome metrics of the CBRLM programme.

These relationships may have important policy implications. Decision-makers in both the Namibian government (e.g., MCA-N) and its partners, particularly MCC, are interested in supporting interventions that are long-run sustainable. If this study establishes a link between measured social capital and programme success, and if certain groups (of people or villages) in Namibia display varying levels of social capital, then policy-makers may choose to target future interventions accordingly. In other words, improved understanding of social capital proxies may enable the agents of economic development to concentrate their efforts amongst those groups of individuals where the returns to their investments are highest.

---

[39] Maluccio et al., 2000; Narayan and Pritchett, 1999

## 5.2 Decision Power in the Household

A portion of the questions in Section J of the survey focus on household decision-making, which is relevant for the 53% of responding households that report the head of the household having a spouse or live-in partner. Overall, the data suggests a fairly high degree of joint decision making in these households, with women more involved in decisions related specifically to intra-household needs and men more involved in inter-household decisions (Figure 5.2.1).

**Figure 5.2.1: Decision power in the household**



Decision on which non-food items to buy

Wife 26%
Joint 60%
Husband 14%

Decision to support relatives

Wife 7%
Joint 76%
Husband 17%
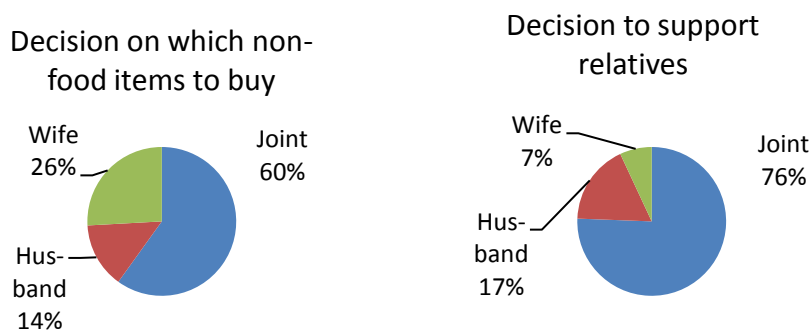
## 5.3 Behavioural and Attitudinal Measures of Social Cohesion and Preferences

### 5.3.1 Attitudinal Measures

*Community Involvement*

Another portion of Section J focuses on how community members interact and engage with one another. Figure 5.3.1.1 presents the number of respondents belonging to various groups and their level of participation in these groups. Overall, 1,510 individuals – or approximately half the sample – reported involvement in at least one group, with the majority participating in religious groups.

**Figure 5.3.1.1: Community involvement by number of participants[40]**
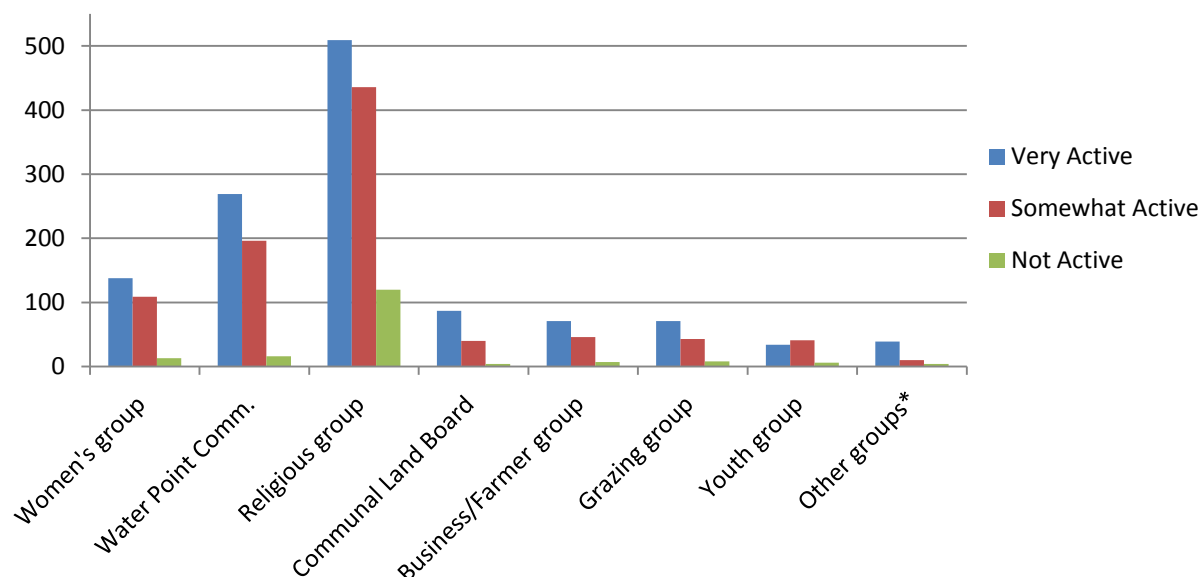


*Attitudinal measures of Trust*

The questions in Section J that relate to trust enable us to measure respondents' level of interpersonal trust. Due to the sensitivity surrounding the use of the word "trust," the idea of trust was attained by asking respondents to state the extent to which they agree or disagree that they would lend their cell phone to different groups of people with varying levels of social distance (a fellow household member, a fellow village member, someone from a neighbouring village and a stranger) and let the person out of sight to use the phone. Phrasing the questions/statements this way without using the word "trust" has two important advantages: (1) the questions make clear *how much* trust subjects are being asked to place in others, and (2) if the word "trust" was used, this probably would have framed behaviour in the Trust Game experiments, which were completed after this section of the survey.

The final question in this subsection of the survey deals with generalised trust, asking respondents whether they believe that, in general, people can be "relied" upon. Note that this question is phrased differently from the most commonly-used generalised trust question discussed above ("Generally speaking, do you think most people can be

---

[40] Other groups that people participate in include Village council/development/cultural committee, Conservancy/forestry group, Committee for disable people, Community support (first aid, drought relief)/policing committee, School Board committee and Sports group. We do not report data for participation in any political party, but the sample is split equally between people who participate and those who do not participate in a political party.

trusted?") and, as with the cell phone questions, our phrasing is intended to minimise the risk of the question influencing experimental behaviour. The results are summarised in Figure 5.3.1.2. As we would expect, the degree of trust falls as social distance increases.

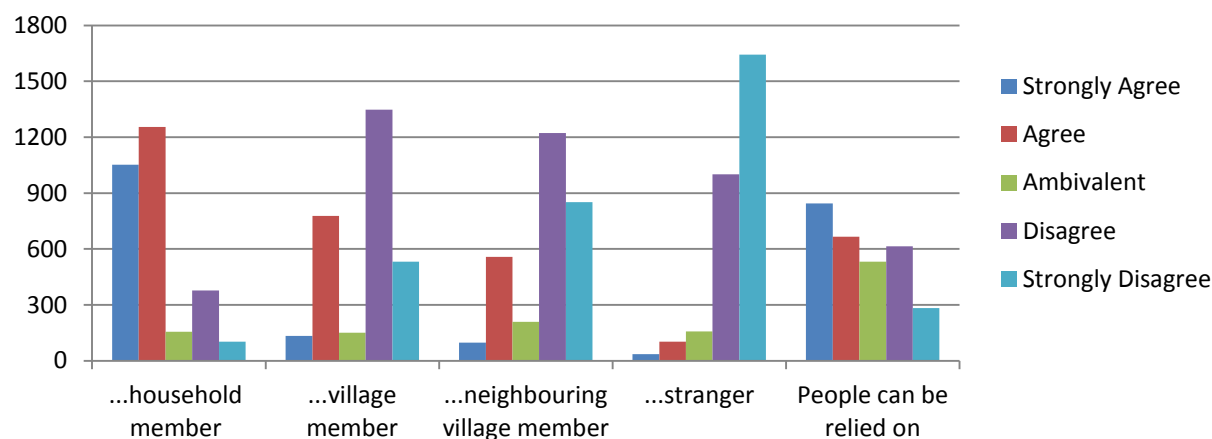**Figure 5.3.1.2: Responses to questions about trust**



Figure 5.3.1.3 illustrates how the number of people who mildly or strongly agree that they would lend a cell phone declines sharply as the radius of trust widens. The finding that trust diminishes with social distance is consistent with previous findings from survey and experimental trust studies.[41] People tend to be more trusting of fellow village members than outsiders. This is probably because they frequently interact (or at least have higher chances of future interactions) with fellow villagers. Trust in fellow villagers will be important in facilitating trades, and resolving collective action problems (such as rangeland management) within the village. However, economic development requires a high degree of generalised trust, rather than a more limited radius of trust, for the market to expand beyond the village boundaries. Note that half of respondents agreed either mildly or strongly with the statement that people in general can be relied on, which is a proxy for generalised trust (including both acquaintances and strangers).

---

[41] For example, Glaeser et al., 2000 in USA; Fershtman and Gneezy, 2001 in Israel; Buchan and Croson (2004) in China and USA; Cadsby et al., 2008 in China; Etang et al., 2011 in Cameroon.

**Figure 5.3.1.3: Trust diminishes with social distance**
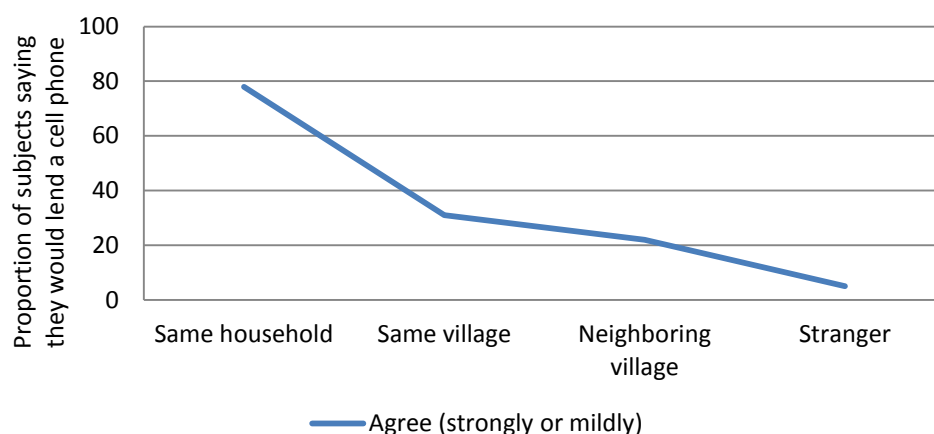


*Altruism and Risk Attitudes*

The results for some of the questions regarding attitudes towards risk and altruism are reported in Figure 5.3.4. The responses are collapsed into two categories, with agree and strongly agree in one category and disagree and strongly disagree in another. Responses to the non-reported questions suggest that people are generally risk averse. For example, 84% of subjects would prefer to invest money in a business that is safe but has low profits than in a business that is unsafe but has high profits. One exception to this trend is the question about a severe leg pain. In this instance, 43% of subjects would prefer to get some medicine that will reduce the pain but will not cure them compared to 57% that would opt to get surgery that will cure them but involves a small risk of death.

The next set of questions asks subjects to make a choice between playing two different activities where a coin flip determines winnings. Again, subjects appear risk averse with 43% choosing the option with the highest guaranteed amount (20 NAD as opposed to 10 NAD) even if this option has a lower maximum possible amount (30 NAD compared to 50 NAD). Our sample also seems to be somewhat present-biased, with 56% of subjects preferring 20 NAD immediately over 60 NAD in two weeks, and 45% preferring 20 NAD in two weeks over 60 NAD in four weeks.

Finally, 69% of surveyed individuals would choose to receive the same amount of money (50 NAD) as another person from their own village over receiving 60 NAD and a fellow villager receiving 10 NAD. This suggests a high degree of generosity or altruism among community members.

**Figure 5.3.1.4: Responses to statements dealing with risk attitudes and altruism**
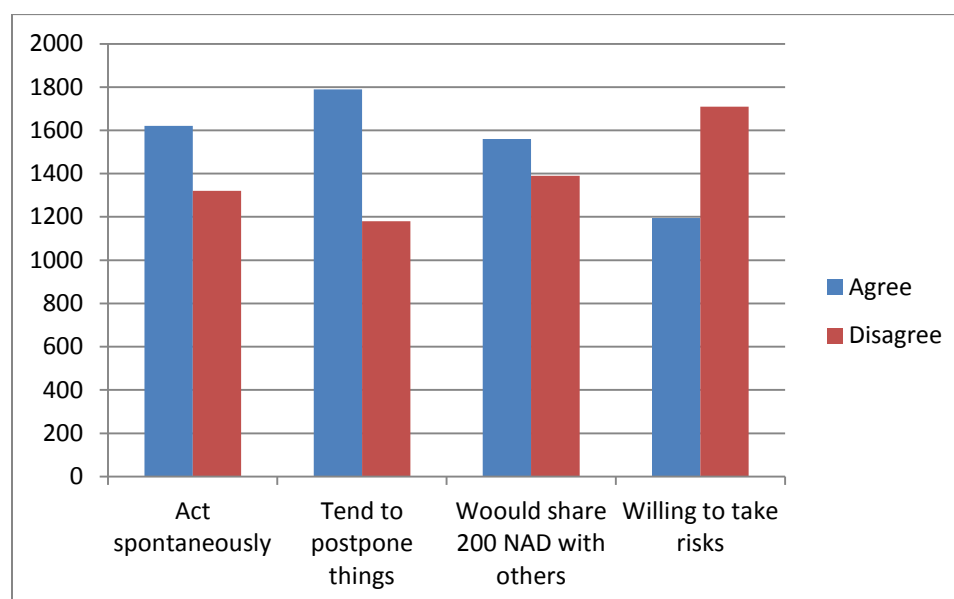


*5.3.2. Behavioural Experiments*

In addition to the survey responses detailed above, we also used a series of behavioural experiments or activities to measure social preferences. Rather than asking respondents how they would act in a certain situation, the activities allow us to analyse perceptions and opinions based on the real-time, monetised decisions that respondents make. The following five experiments were conducted:

1. **PG Village** – This is a standard Public Goods Game. In this experiment, subjects are split into groups with four people in each group. Subjects are informed that they will be grouped with three other members of their own village or a neighbouring village, but they do not know who the other group members are. Each subject is given four tokens (worth 4 NAD in cell phone credit)[42] and has to decide how many tokens (if any) to contribute to the group pot (i.e. the public good). The sum of all contributions made to the group pot is then doubled and shared equally among all members of the group, regardless of how much each individual contributed to the pot. Any money not contributed to the group pot is kept by the subject (i.e. personal account).

---

[42] Each token is worth 1 Namibian dollar (at the time the field work was conducted US$1 was worth about 7 NAD).

2. **PG Headshare** – This is the same as PG Village, except that after the tokens are doubled, the village head or headman will decide how to allocate the group pot back to the subjects. The decision is completely the village head's, who will not know the identity of the subjects. The headman only knows how much is contributed by persons 1, 2 , 3 and 4, but does not know who these people are.

3. **PG Headkeep** – This is the same as PG Headshare, but this time the village head is allowed to allocate some of the pot to himself, if he so chooses.

   *Typical Interpretation of Pubic Goods Game results: The amount each subject contributes to the group pot is interpreted as a measure of his level of **cooperation** with other community members: how much a subject is willing to contribute to public goods on the expectation that his fellow community members will contribute a lot or a little of their resource to a group pot.*

4. **TG Village** - This is a standard Trust Game with two subjects: Player A and Player B.  As with the Public Goods Games, subjects are told that they are paired with someone from their own village or a neighbouring village, but they do not know who that person is. In the Trust game, Player A receives four tokens and decides how many (if any) to send to Player B. The amount Player A sends to Player B is tripled. Player B then decides how many tokens (if any) to return to Player A.  This is a one-shot game.  Each subject plays both the role of Player A and Player B.  They first make decisions in the role of Player A.  Then, assuming the role of Player B, the subject states how many of the received tokens they would return to Player A for each possible amount received: 3, 6, 9 and 12 (i.e. triple the amount sent by Player A).  Finally, subjects choose whether they would like to be Player A or Player B.

5. **TG Head** – This is the same as TG Village, except that Player B is the village head.

Typical interpretation of Trust Game results: The amount sent by Player A is interpreted as a measure of **trust** and Player B's actions interpreted as a measure of either **trustworthiness** or **reciprocity**. The standard game-theoretic prediction for a single anonymous interaction between two purely self-interested individuals is for Player A to send nothing, rationally anticipating that Player B will not reciprocate.

   *5.3.3. Experimental Results*

*Cooperation and trust in the experiments*
The levels of cooperation and trust observed in the experiments are summarised in Figure 5.3.3.1.  Starting with the Public Goods Games, subjects seem to possess high levels of cooperation.  The mean contribution in the standard Public Goods Game (PG

Village) is 60%. This is much higher than the corresponding finding of 48% in Zimbabwe but similar to the 58% found in Kenya.[43] The mean contribution in the game in which the village head allocates the resources to the group members without being allowed to keep anything for himself (PG Headshare) is also 60%. However, contributions to the public good from which the village head is allowed to keep some of the resources if he chooses to (PG Headkeep) are generally lower, with the mean amount contributed being 56%. Mean comparison tests for paired data suggest that the difference in mean contribution in either PG Village or PG Headshare and PG Headkeep is statistically significant at 1%. Also noteworthy is that the number of subjects contributing nothing to the group account (i.e. free-riders) is 71 for PG Village, which is lower than 100 for PG Headshare, and a lot lower than 215 for PG Headkeep (although 20% of subjects contributed all four tokens in all three games). As with the Public Goods Games, fewer subjects sent zero amounts in TG Village than in TG Head (73 and 118, respectively). For both Trust Games the same fraction of subjects (3%) sent all four tokens to player B. The most common amount contributed or sent in all the games was exactly half of the endowment.

On average, in both Trust Games (TG Village and TG Head), Player A sends about the same amount (45%) regardless of whether Player B is a fellow community member or the village head. This suggests that subjects are no more trusting of other villagers than they are of the village head. However, the average amount contributed to the Public Goods Game declines when individuals know their village head can decide to keep some or all of the resources from the group account. This lower level of cooperation could stem from distrust in the village chief's re-allocation policy, *or* perhaps from the belief that other members of the community distrust the village chief's re-allocation policy. Either scenario would result in a lower amount of resources available to the group, leading to lower individual contributions.

---

[43] Barr, 2001; Ensminger, 2000; see Appendix 5.3.3.1 for more Trust Game findings from Africa.

**Figure 5.3.3.1 Mean proportion contributed (trust) in games with standard deviation intervals[44]**
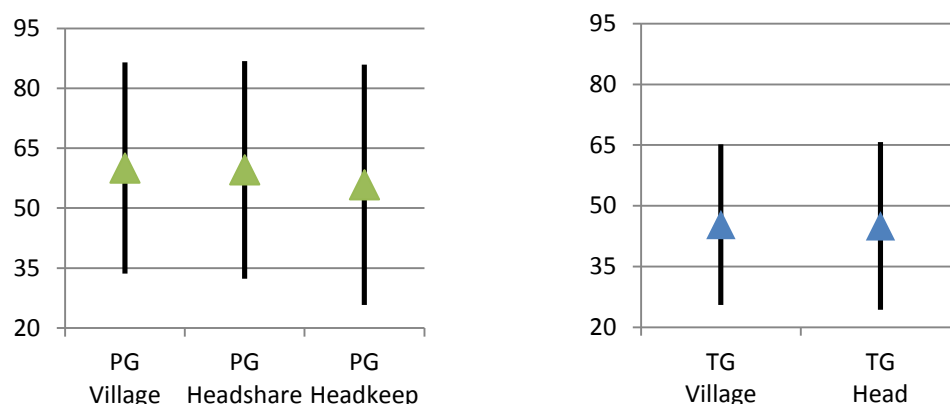


*Trustworthiness or reciprocity in TG Village*

We also examine how subjects behave in their role as Player B in TG Village. Since Player B's receive different sums of money from Player A's, we look at the proportion (rather than amount) returned by Player B for each amount received. The results, presented in Figure 5.3.3.2, do not show that the mean amount returned increases significantly with the amount received. Rather, when Player B receives just three tokens, he returns 44% of that amount on average, which is more than the average proportion returned when the amount received is more than three tokens (*p-value* = 0.00).[45] This result may be driven by the fact that three tokens (or 3 NAD of cell phone credit) are considered an inconsequential amount to some Player B's.

---

[44] The number of observations varies across games (ranging between 2877 and 2890) mainly because some participants chose not to play some of the games.

[45] When three tokens are received, 12% of subjects return nothing and 7% return everything to Player A. Whereas, when more than three tokens are received, 1% of subject return nothing and another 1% return everything to Player A.

**Figure 5.3.3.2: Mean proportion returned (trustworthiness) in TG Village by amount received with standard deviation intervals**
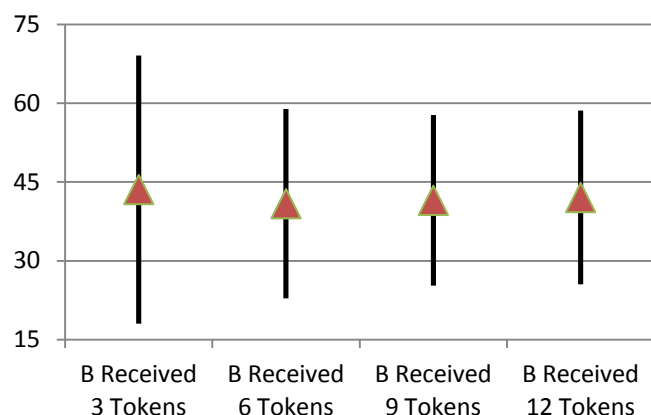


Given that the amount sent is tripled, Player A is no worse off if Player B returns one-third of the tripled amount. Hence, finding that the mean proportion returned for any possible amount received is more than one-third of the tripled amount sent suggests that Player A's are generally better off for having sent money. The fact that Player B's would return high amounts suggests that their "reputation" is more important than any personal economic benefit; otherwise, they would have chosen to return lower amounts or nothing at all. Although some Player B's return zero amounts, trusting behaviour generally pays off for the Player A's.[46]

After playing the roles of Player A and Player B in TG Village, subjects were asked to indicate whether they would like to be Player A or Player B. 42% of subjects chose to be Player B. It could be that this category of subjects trusts that Player A would send them some tokens back. Also, those who choose to be Player B could simply be less risk averse compared to those choosing to be Player A.

Next, we examine if behaviour in the games varies across the regions in our sample. The results are summarised in Figure 5.3.3.3 (trust and cooperation) and Figure 5.3.3.4 (trustworthiness). The four "O" regions exhibit higher levels of cooperation and trust, with Oshikoto having the highest mean contributions in the Public Goods Games and amount sent in the Trust Games. A large variation in behaviour between regions is particularly seen in PG Village (see Figure 5.3.3.5). The Oshikoto region also exhibits the highest levels of reciprocity/trustworthiness in TG Village. At the other end of the

---

[46] For any amount received, the mean proportion returned is similar to findings from many previous studies. For example, 43% in Zimbabwe (Barr, 2003), 41% in Kenya (Greig and Bohnet, 2005), 42% in South Africa (Carter and Castillo, 2003), 43% in Peru (Karlan, 2005), 44% in Paraguay and Costa Rica - CEOs (Schechter, 2007; Fehr and List, 2002, respectively) and 41% in Colombia (Cardenas, 2003). However, the mean proportion returned in Namibia is somewhat higher than the 35% found in Tanzania by Holm and Danielson (2005) and the 33% found in Uganda by Mosley and Verschoor (2005).

spectrum, the lowest levels of cooperation, trust and trustworthiness were observed among subjects in the Kunene region.

**Figure 5.3.3.3: Mean proportion contributed (cooperation) in PG's and sent (trust) in TG's by region**
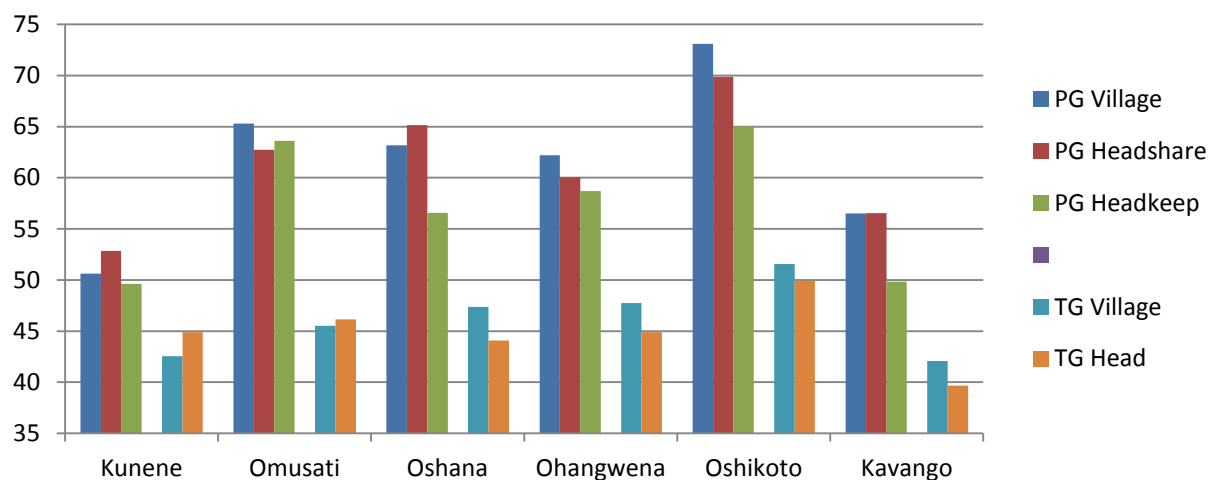


**Figure 5.3.3.4: Mean proportion returned (trustworthiness) in TG Village by amount received and by region**
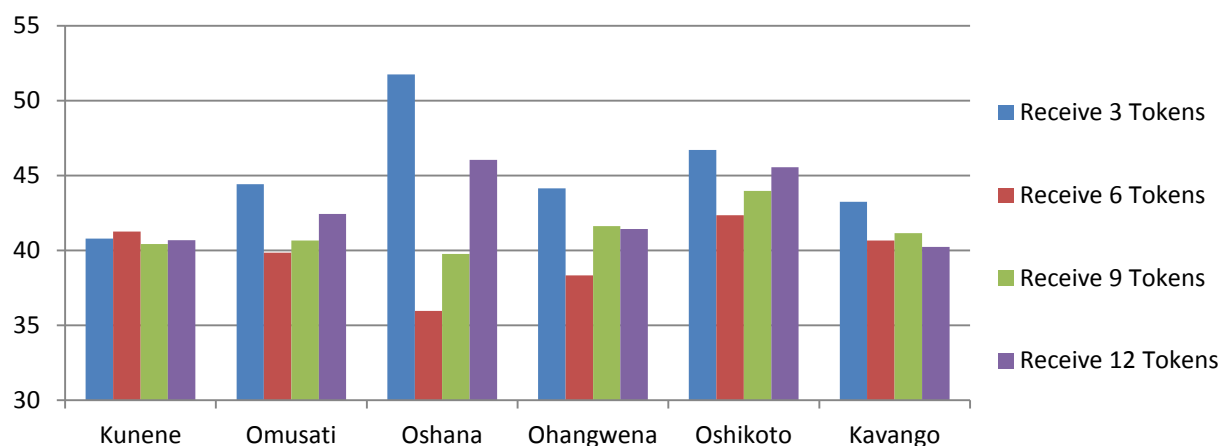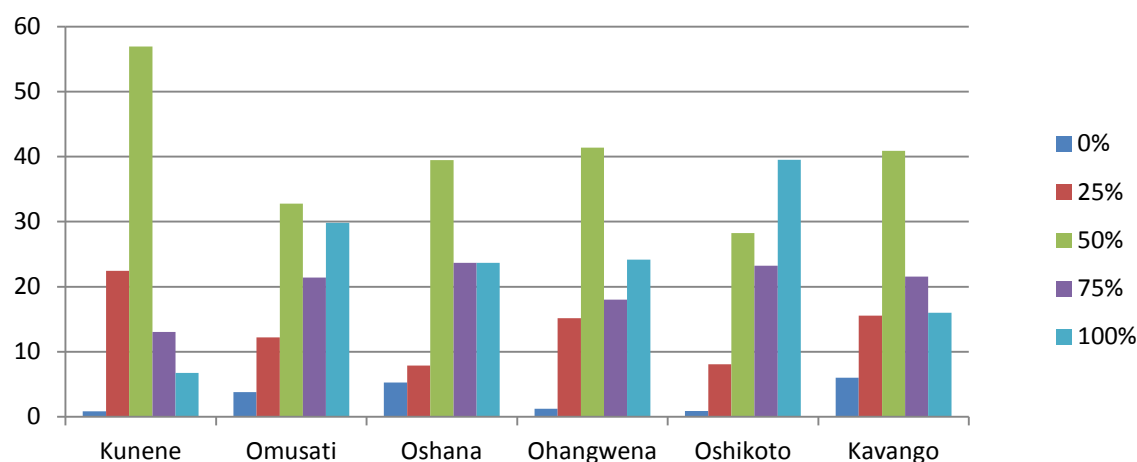
**Figure 5.3.3.5: Distribution of amount contributed (cooperation) in PG Village by region**



*Village head behaviour in Public Goods Experiments*

We now examine the behaviour of the village head or headman in the experiments: how he allocated resources in PG Headshare and PG Headkeep. In general, the headman's allocation of resources to group members depended on how much each member contributed to the group pot. Although there were some instances where the headman distributed the pot equally among group members, he typically tended to give more to people who contributed more and vice versa. It is also interesting to investigate how much the headman allocated to himself when he had the option to do so in PG Headkeep. The mean amount of tokens kept by the headman is 20.5% of the total in the group pot. As Figure 5.3.3.6 clearly indicates, the amount kept by the headman is an increasing function of the amount in the group pot: the more resources in the pot, the more the headman would allocate to himself. Note however that the modal amount kept by the headman is zero. The next most common amount kept is one-quarter of the pot, with the headman keeping everything on just one occasion. After deciding what proportion of the pot to keep for himself, the headman again generally gave more to those who contributed more to the group pot.

**Figure 5.3.3.6: Amount Kept by the Village Head conditional on the amount in the pot**
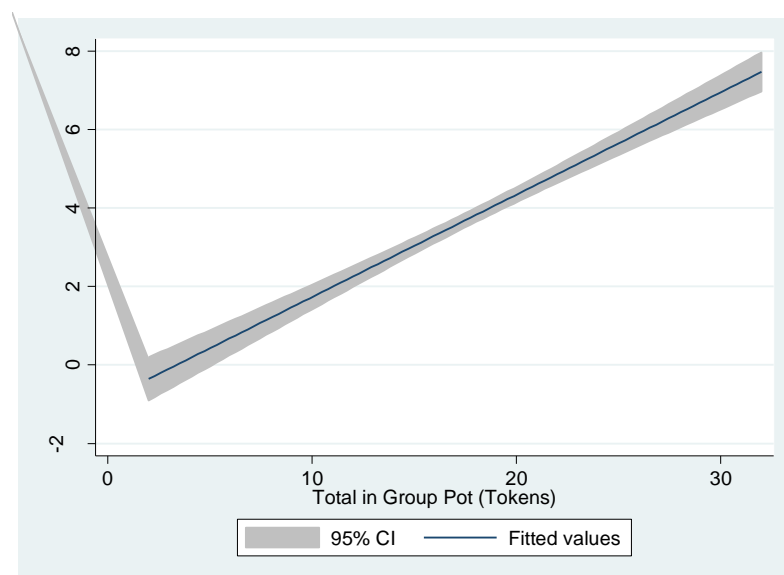


*Trustworthiness or reciprocity of the village head*

In TG Head, the village head or headman played the role of Player B. His behaviour in this experiment is analysed and the results are summarised in Figure 5.3.3.7. The table clearly indicates that the more the headman receives the less he returns to Player A. This pattern of trustworthiness is clearer than the patterns of either trustworthiness or reciprocity of the other community members. The mean proportion returned is highest when the headman receives three tokens (46%), and this is significantly higher than the mean proportion returned when he received six tokens (*p-value* = 0.09). Similarly, the mean proportion returned when six tokens are received is significantly higher than the corresponding figure when the headman receives nine tokens (*p-value* = 0.01). However, the difference between the mean proportion returned out of nine tokens and that returned from twelve tokens is statistically not different from zero. Compared to the proportions returned in TG Village (Figure 5.3.3.2), it seems that headmen are generally more trustworthy than other villagers.

**Figure 5.3.3.7: Mean proportion returned (trustworthiness) in TG Head by amount received with standard deviation intervals**
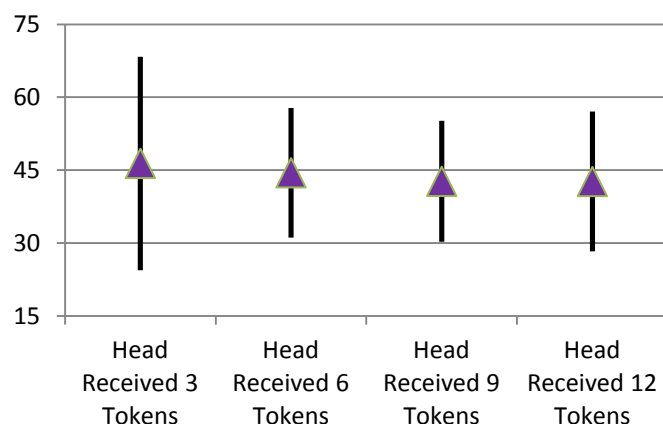


Overall, participants earned an average of 26 tokens from all the experiments and received six vouchers worth 30 NAD in cell phone credit.

## 5.4    Analysis

Next, we analyse the determinants of behaviour in the experiments. The main hypothesis we are testing is the extent to which people are willing to trust their village head and other members of their community, as measured by their contributions to public goods. We conduct multivariate regression analyses with contributions in the Public Goods Games and the amount sent in the Trust Games as the dependent variables. Behaviour in each game is analysed as a function of both individual subject attributes and community level attributes. The initial results are summarised below.

*Cooperation in Public Goods Experiments:*
- Trust, as measured by either the amount sent in the TG Village or the generalised trust question, is significantly positively correlated with contributions in the Public Goods Games (i.e. a measure of cooperation). This is consistent with expectations.
- The amount sent in TG Head (i.e. trust in the village head) is a significant determinant of contributions in PG Headshare and PG Headkeep.
- Voluntary participation in associations is significant for PG Village only.
- People who are willing to take risks contribute less in the Public Goods Games.
- Those in bigger households contribute more.

| | Trust (send in TG's) | Trustworthiness (return in TG's) | Cooperation (contribute in PG's) |
|---|---|---|---|
| Participate in groups | ↑ | ↑ | ↑ |
| Send in TG Village | | ↑ | ↑ |
| Send in TG Head | | | ↑ |
| Chose Player B | ↑ | ↓ | |
| Lend cell phone | ↑ | ↑ | ↑ |
| Generalised trust | ↑ | ↑ | ↑ |
| Act spontaneously | ↔ | ↓ | |
| Procrastination | ↔ | ↓ | |
| Riskiness | ↓ | | |
| Altruism, generosity | ↓ | ↔ | ↔ |
| Use public tap | | | ↓ |
| Own cattle | ↓ | | |
| Extra-HH decider | ↑ | ↔ | ↓ |
| Attended school | ↑ | ↓ | ↑ |
| Age | ↔ | ↔ | ↔ |
| Female | ↓ | ↔ | ↑ |
| Log income | ↔ | ↓ | ↔ |
| Kunene | ↑ | ↑ | ↓ |
| Omusati | ↑ | ↑ | ↔ |
| Oshana | ↔ | ↔ | ↓ |
| Ohangwena | ↔ | ↑ | ↓ |
| Oshikoto | ↑ | ↔ | ↑ |

Trust Behaviour:

- Some survey-based measures of trust (lending cell phone to someone from a neighbouring village or to a stranger) are correlated with experimental trust.
- Voluntary participation in associations matters only for trust in the village head.
- Choosing to be Player B is not a significant determinant of the amount sent
- Amounts sent in the Trust Games are neither motivated by altruism nor generosity (as proxied by the willingness to share money with others)

Trustworthiness or reciprocity:
- Voluntary participation in associations matters for trustworthiness
- The proportion returned as Player B is strongly correlated with the amount sent as Player A (i.e. own trust), suggesting that people who are more trusting are also more trustworthy. This is consistent with previous findings (for example, Glaeser et al., 2000).
- The proportion returned as Player B is not dependent on the amount received from Player A. In other words, trustworthiness does not increase with trust. Thus, while the proportion returned is independent of the amount received for most of the subjects, it is strongly correlated to their amount sent as a Player A.
- Participants who chose to Player B turn out to be less trustworthy.

Generally, there appears to be very little variation in experimental behaviour with respect to gender. It remains to be seen whether the CBRLM intervention will improve levels of social capital as one would expect. It also remains to be seen whether such intervention effects will vary significantly between males and females and across regions. The endline behavioural experiments will allow such analyses to be conducted.

## Appendix 5.3.3.1: Previous Trust Games in Africa and the CBRLM Household Income and Expenditure Survey Findings

| Author (s) | Country | Mean Amount Sent (%) | Mean Amount Returned (%) | Student Participants? |
|---|---|---|---|---|
| **Ashraf *et al.* (2006)** | South Africa | 43 | 27 | Yes |
| **Barr (2003)** | Zimbabwe | 43 | 43 | No |
| **Burns (2004)** | South Africa | 33 | 23 | Yes |
| **Carter & Castillo (2003)** | South Africa | 53 | 38 | No |
| **Danielson & Holm (2007)** | Tanzania | 56 | 46 | No |
| **Ensminger (2000)** | Kenya | 44 | 18 | No |
| **Etang *et al.* (2011)** | Cameroon | 69 | 47 | No |
| **Greig & Bohnet (2005)** | Kenya | 30 | 41 | No |
| **Haile *et al.* (2006)** | South Africa | 55 | 28 | Yes |
| **Holm & Danielson (2005)** | Tanzania | 53 | 37 | Yes |
| **Mosley & Verschoor (2005)** | Uganda | 49 | 33 | No |
| **CBRLM Findings (2011)** | Namibia | 45 | 41-44* | No |

Notes: * Player B would return 44%, 41%, 42% and 42% if Player A sent one, two, three and four tokens, respectively. Recall that Player B receives triple the amount sent.