Evaluation Design Report

For the Community Based Rangeland and Livestock Management Program in Namibia

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LIST OF ACRONYMS AND ABBREVIATIONS

CBRNM	Community Based Natural Resource Management
CBRLM	Community Based Rangeland and Livestock Management
CLS	Communal Land Support
DEES	Directorate of Extension and Engineering Services (in MAWF)
GA	Grazing Area
GIS	Geographic Information Systems
GOPA	Gesellschaft für Organisation, Planung und Ausbildung
HRM	Holistic Rangeland Management
IPA	Innovations for Poverty Action
IRB	Institutional Review Board
IRDNC	Integrated Rural Development and Nature Conservation
ITT	Intention-to-Treat
MAWF	Ministry of Agriculture, Water, and Forestry
MCA-N	Millennium Challenge Account Namibia
MCC	Millennium Challenge Corporation
MDE	Minimum Detectable Effect
MEATCO	Meat Corporation of Namibia
NAD	Namibian Dollars
NCAs	Northern Communal Areas
NHIES	National Household Income and Expenditures Survey
OCL	Objective Criteria Listing
PGCH	Planned Grazing and Combined Herding
PI	Primary Investigator
RCT	Randomized Controlled Trial
RIA	Rangeland Intervention Area
TA	Traditional Authority
TOC	Tragedy of the Commons
USD	United States of America Dollars

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1. Introduction

Innovations for Poverty Action (IPA) has been tasked with a mixed methods evaluation of the Community-Based Rangeland and Livestock Management (CBRLM) program, a sub-activity of the Namibia Compact, with a major component of the evaluation being a randomized controlled trial (RCT). The CBRLM program is a multi-year intervention implemented by GOPA Consortium which looks to benefit cattle farmers in the northern part of the country through technical assistance in the areas of community development, rangeland management, livestock management, livestock marketing, and targeted infrastructure support (including substantial investment in water access).[1] At the heart of the program are a series of community-based natural resource management strategies that look to mitigate persistent 'tragedy of the commons' type problems that have the potential to negatively impact livelihoods, rangeland, and livestock in the region.

Currently, however, there is limited rigorous evidence on the effectiveness of community-based natural resource management programs of this kind. Expert opinion is divided on everything from the sustainability and scalability of the approach to the necessary set of enabling conditions. Still, the popularity of community-based interventions continues to grow. Therefore, this evaluation represents an excellent opportunity to substantially guide policy-making using sound evidence, both in Namibia and in other low-to-medium income countries.

The evaluation is not without its challenges. Due to a combination of political and practical concerns, this randomization is clustered across just forty-one large geographic units.[2] The combination of relatively few clusters, no baseline data, and a questionable optimal exposure period means that statistical power is a primary concern. As a result, IPA has endeavored upon a revised sampling strategy to better align the data collection areas with the program intervention areas. This strategy is complemented by a qualitative evaluation component that looks to answer questions that are not amenable to quantitative analysis through the RCT framework. Taken together, this evaluation hopes to shed valuable light on the impact of the CBRLM program on the cattle and cattle farmers, as well as other outcomes of interest, in northern Namibia.

[1] While the contract period for GOPA is close to 4.5 years, the intervention itself was shorter due to the mobilization period at the outset of the contract.

[2] Forty-one units were randomized and will form the basis of the evaluation regardless of where GOPA chooses to work and not to work.

2. Program Overview

2.1 The Namibia Compact

The Millennium Challenge Corporation (MCC) signed a $304.5 million Compact with the Republic of Namibia in July 2008 that includes three projects: agriculture, tourism, and education. The Compact entered into force in September 2009 and is now under implementation. The goal of the Namibia Compact is to reduce poverty through economic growth in the education, tourism, and agriculture sectors. To accomplish this goal, Millennium Challenge Account Namibia (MCA-N) aims to achieve the following objectives:

- Increase the competence of the Namibian workforce (i.e., knowledge, skills, etc.) and
- Increase the productivity of agricultural and non-agricultural enterprises in rural areas.

The Agriculture Project includes three activities: livestock, land access and management, and indigenous natural products. The Land Access and Management Activity aims to improve rangeland management and provide more equitable and secure access to land in the Northern Communal Areas (NCAs) and, to this end, it includes two sub-activities: Community-Based Rangeland and Livestock Management (CBRLM) and Communal Land Support (CLS). Under the CLS sub-activity, Communal Land Boards, Traditional Authorities (TAs) and other key stakeholders – most notably community members themselves – will be empowered to better control and manage the available resources. Under the CBRLM sub-activity, improved rangeland and livestock management are hoped to be achieved through a series of interventions, including enhanced community-based land use planning for rangelands, the introduction of technologies and skills to improve grasses and thereby productivity of livestock, animal husbandry best practices, and improved entrepreneurial skills.

2.2 The CBRLM Sub-Activity

The CBRLM sub-activity covers seven regions in northern Namibia: Kunene, Omusati, Oshana, Ohangwena, Oshikoto, Kavanago East, and Kavango West. Approximately 1.2 million people live in this largely farming-dependent area. Kunene's production is primarily livestock-based; Omusati, Oshana, Ohangwena, and Oshikoto depend on a mixture of agriculture and livestock; and Kavango adheres to primarily crop-based agriculture. The CBRLM program centers on the belief that land-use management strategies, led by communities themselves, will help to overcome the current problems of environmental degradation and low-productivity in cattle farming. As such, the consultant hired to implement the CBRLM program, GOPA Consortium (GOPA), works with a select group of communities to identify the communities' specific needs and challenges, and to develop, over the duration of the intervention, a tailored program for each.[3] While it is largely up to the beneficiaries to determine the specific land-use and production goals and related strategies to be pursued, the CBRLM intervention encompasses the following activity and training areas:

[3] Presumably, to the way the type of intervention GOPA applies to each community is endogenous, the *intensity* of treatment that GOPA applies to each community is also endongenous – i.e., is based on the communities' specific needs and challenges. Therefore, our analysis of the effect of the intervention ("T", discussed in Section 6.1.1) should not seek to differentiate between e.g., "low" and "high" intensities of treatment but should rather adhere to a binary classification of "treated" and "not treated."

- Community Development – Each targeted community works with GOPA to develop a Grazing Area (GA) Committee that functions as the focal point for CBRLM planning and decision-making.
- Rangeland Management –Targeted communities work with GOPA to learn how to "read the rangeland" and implement planned grazing and combined herding (PGCH).
- Livestock Management – Targeted communities work with GOPA to develop and implement livestock management plans, including livestock handling, herd restructuring, improved animal husbandry and veterinary care, and the introduction of new cattle genes via a bull scheme.
- Livestock Marketing– Targeted communities work with GOPA to develop livestock marketing plans, improve business skills, introduce marketing infrastructure such as auction facilities, and increase offtake capacity. Across the NCAs, GOPA also develops regional farmers' co-operatives and explores international livestock marketing opportunities.
- Water Infrastructure Support – Targeted communities work with GOPA to identify the infrastructural support (e.g., water point creation or repair) required to effectively implement CBRLM. (The original amount allocated to this component, $1 million, was subsequently increased to $3 million.)

The contractual implementation targets require that GOPA work with at least 1,500 households that have ten heads of cattle (or livestock equivalents) or more. (Many households in the area raise small stock, such as goats, six of which are equal to one large stock unit. So, while the focus of the intervention is on large stock, the animal husbandry aspect of the project should also assist owners of small stock, many of whom are anticipated to be women.)

2.3. Program Logic

The Program Logic for the CBRLM program (available in Appendix A) was developed in early 2013 by the IPA evaluation team with input from key stakeholders, primarily Algerlynn Gill of MCC. It is a visual representation of the various components of the CBRLM intervention (organized as rows), as well as the Inputs, Activities, Outputs, Outcomes, and Goals associated with each individual component (organized as columns). Due to the dynamic nature of the CBRLM intervention, the Program Logic is periodically updated to reflect the latest iteration of GOPA's interventions and intervention strategies that GOPA makes available to IPA.

2.4 ERR and Beneficiary Analysis

2.4.1 Economic Rate of Return

The Economic Rate or Return (ERR) projections created by MCC predict that the Agricultural Project's Activities in northern Namibia will achieve modest medium-term improvements in the security of land tenure, the productivity and sustainability of communal rangeland resources, livestock productivity, and the efficiency of livestock marketing and quarantine systems.[4] According to these projections, the Sub-activities – in particular Communal Land Support and CBRLM – will have created enabling conditions for communal and poor farmers to benefit from future public investments in the livestock sector.

Quantified, the benefits to communities that take up CBRLM practices were projected to be, most directly, cattle sold in healthier condition and at a more appropriate age. While the price per kilogram

[4] http://www.mcc.gov/pages/countries/err/namibia-compact

was not expected to increase for these cattle, the value per head was expected to be higher because the animals were expected to be in better condition. Price per cattle was expected to increase by about 10% on average. The fraction of cattle marketed formally by farmers, as opposed to selling them informally, was also expected to increase from 30% of cattle marketed formally (MCC's estimated current rate) to 60% of cattle within the project sample. Aside from cattle health and age at sale, this helps to explain the expected increase in income to farmers. Lastly, according to MCC's projections, better herd management practices were expected to nearly double the calving rate (from 40% to 70%) and drastically reduce weaning mortality (from 40% to 5%).

According to technical experts, the effects of CBRLM were not expected to manifest in the case of drought, as it was thought that communities would be too pressed to put the additional resources and attention into communal grazing best practices. Therefore, the annual probability of drought enters into the ERR model as a modifier on each year's expected benefits, increasing mortality from 2.8% expected optimum to 8.0% in drought conditions. Finally, the CBRLM project expected to increase the availability of fodder and quality of rangeland by reducing overgrazing (both by reducing herd sizes and encouraging communities to develop communal grazing plans). The benefit of rangeland health was not directly estimated in the cost-benefit model, but it is implied that it is this rangeland health which in part allows the value increases of cattle to a sustainable level.

As a result of the uncertainty around project take-up, sustainability, and environmental conditions such as drought, the ERR analysis conducted by MCC's Economist currently lists multiple scenarios. The lowest-return scenario envisages some treatment communities discontinuing CBRLM-type activities a) in the absence of external CBRLM-type support following the Compact and b) due to the onset of drought. In this scenario, some communities *do* rebound and re-initiate CBRLM-type activities after the drought has passed. The middle-return scenario is similar to the lowest-return scenario, but assumes fewer communities fall off due to drought and, after Year 6 (of a 20-year projection), new communities actually adopt CBRLM-type activities and thus reap benefits from the project. The high-return scenario assumes the largest number of participating communities. Under this scenario, new GAs are brought into the program by whichever entity continues the intervention post-Compact.

2.4.2 Beneficiary Analysis

MCC completed a *Retrospective Beneficiary Analysis* for the Namibia Compact in August 2010. As part of this analysis, MCC identified the beneficiaries of the CBRLM project as "communal and poor farmers" in the region. MCC then estimated the number of expected beneficiaries using the number of livestock owners and their dependents that were expected to be impacted over a twenty-year time horizon. Using that approach, MCC arrived at a figure of 749,849 estimated beneficiaries of the Land Access and Livestock Support Activities in Year 20. Within this population of beneficiaries, 41% were expected to live off less than $2 per day, and 14% were expected to live off less than $1.25 per day (using 2005 purchasing parity international dollars). A food consumption measure of poverty produced similar results to the "Dollar a day" approach: it was estimated that within this population of beneficiaries, 42% would be "poor" and 5% would be "extremely poor."

In keeping with the general approach of the ERR projections described above, the Beneficiary Analysis presented the expected income gains that would accrue to beneficiaries over the 20-year lifespan of each Activity by poverty category. This analysis projected that individuals living off less than $1.25 per day stood to benefit $8, individuals living off $1.25 to $2 per day stood to benefit $13, individuals living off $2 to $4 per day stood to benefit $26, and individuals living off more than $4 per day stood to

benefit $88. (These assumptions fed into the cost-effectiveness estimates – or dollars of benefits per dollar of project investment – at the core of the ERR analysis.) MCC also conducted beneficiary analysis by gender and language group. To the extent possible, given the statistical power limitations discussed below, IPA will take a similar approach in the Final Report for this study by investigating heterogeneous treatment effects by household income category and gender.

3. Literature Review

Over the past twenty odd years, community-based rangeland and livestock management has gained popularity as a development strategy.[5] However, to the best of our knowledge, such an approach has yet to be rigorously evaluated. Therefore, MCC's decision to employ a randomized evaluation of the CBRLM program in Namibia offers a unique opportunity to test important but unresolved questions surrounding this approach. This section reviews literature on the key development challenges facing the NCAs, the CBRLM programmatic responses to these challenges, the academic debate concerning community-based natural resource management, and sustainability concerns related to this approach.

3.1 Challenges Facing the NCAs

Among rural households in Namibia, some 27% live below the poverty line and 14% suffer from severe poverty, with a high concentration of these vulnerable populations located in the NCAs.[6] While the root causes of persistent poverty are complex and variable, experts emphasize degraded environmental conditions,[7] underdeveloped livestock markets,[8] and cultural biases against selling livestock[9] as important drivers of economic underdevelopment.

Rural poverty in the NCAs is closely tied to the rapid degradation of communal rangeland.[10] While northern Namibia has long been classified as a brittle ecosystem,[11] a combination of population pressure,[12] poor environmental management practices,[13] overstocking of livestock,[14] and climate

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[5] *On growing popularity of CBRLM*: Xiaoyi, Wang, and Maria E. Fernandez-Giménez. "Community-Based Rangeland Management." *Restoring Community Connections to the Land: Building Resilience Through Community-based Rangeland Management in China and Mongolia* (2012): 209. ; Blaikie, Piers. "Is small really beautiful? Community-based natural resource management in Malawi and Botswana." *World development* 34.11 (2006): 1942-1957.
On community based development and conservation: Berkes, Fikret. "Rethinking community-based conservation." *Conservation biology* 18.3 (2004): 621-630. ; Wong, Susan. 2012. *What have been the impacts of World Bank Community-Driven Development Programs? CDD impact evaluation review and operational and research implications*. Washington, DC: World Bank.

[6] Namibia National Statistics Agency.*Namibia – National Household Income and Expenditure Survey, 2009-2010.*

[7] Mendelsohn, John M. *Farming systems in Namibia*. RAISON (Research & Information Services of Namibia), 2006.

[8] Scoones, Ian, and William Wolmer. *Livestock, disease, trade and markets: policy choices for the livestock sector in Africa*. Vol. 269. Institute of Development Studies, University of Sussex, 2006.

[9] Düvel, Gustav H. "Livestock marketing in Northern Namibia: Cultural versus economic incentives." (2001).

[10] Bollig, Michael, and Anja Schulte. "Environmental change and pastoral perceptions: degradation and indigenous knowledge in two African pastoral communities." *Human ecology* 27.3 (1999): 493-514.

[11] Mendelsohn, John M. *Farming systems in Namibia*. RAISON (Research & Information Services of Namibia), 2006.

[12] Verlinden, A., and A. S. Kruger. "Changing grazing systems in central north Namibia." *Land Degradation & Development* 18.2 (2007): 179-197.

[13] Schneiderat, Ute. "Communal rangelands in northern and central Namibia: the grazing and browsing resources and their users." (2011).

[14] Rothauge, A. "Some Principles of Sustainable Rangeland Management in Namibia." *Agricola* 17 (2007): 7-15.

change[15] have all combined to substantially reduce the carrying capacity of the grazing lands in recent times. The challenges of rural poverty in the NCAs are also magnified by the degradation of livestock. Livestock markets in the NCAs are hampered by under-vaccinated, inefficiently-composed herds.[16]

The livelihoods, rangeland, and livestock that have been degraded all share a common underlying problem: the failure of communities to successfully manage their natural resources. In the absence of private property rights or effective government regulation, communal farmers may face a classic "tragedy of the commons" (TOC) problem in which individual contributions to public goods (e.g., rangeland improvement or vaccinations) are easily usurped by non-contributing neighbors (e.g., "free-riders" or grass poachers).[17] While there are many examples of communities that have successfully overcome the TOC problem in community-based natural resource management,[18] scholars emphasize that these solutions typically require effective communal institutions to plan, monitor, and enforce management solutions,[19] as well as high levels of social trust and cooperation to ensure sustainability.[20]

3.2 CBRLM Programmatic Solutions

Increasingly, practitioners and scholars have advocated for the use of holistic rangeland management (HRM) in response to rangeland degradation in regions like northern Namibia.[21] While the definition of HRM is a matter of debate, most experts agree that it consists of a combination of combined herding, planned (short-duration) grazing, and attentiveness to the complex interplay of environment, livestock, and community needs.[22] HRM remains controversial among scholars and practitioners.[23] While there are anecdotal examples of successful HRM,[24] debates about the broader efficacy, scalability, and sustainability of HRM in communal settings remain mired in definitional ambiguity and a lack of rigorous evidence.

Debates over improving livestock management practices face similar obstacles. Many livestock management experts argue that effective livestock farming in the NCA's requires increased vaccinations, improved genetic composition of herds, training on best-practices for livestock care, and more efficient herd composition.[25] However, some critics argue that mainstream approaches to livestock management are poorly suited to communal management in brittle environments.[26] For example, some critics argue

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[15]Reid, Hannah, and Hannah Reid Linda Sahlén Jesper Stage James MacGregor. *The economic impact of climate change in Namibia: how climate change will affect the contribution of Namibia's natural resources to its economy*. Vol. 7. No. 2. IIED, 2007.
Barnes, J., Alberts, M,.& MacGregor, J. 2010. The economic impact of climate change on land use in Namibia. Unpublished Draft Paper, International Institute for Environment and Development (IIED) London, UK.
[16]Mendelsohn, John M. *Farming systems in Namibia*. RAISON (Research & Information Services of Namibia), 2006
[17]Hardin, Garrett. "The tragedy of the commons." *New York* (1968).
[18]Ostrom, Elinor. *Governing the commons: The evolution of institutions for collective action*. Cambridge university press, 1990.
[19]Dietz, Thomas, Elinor Ostrom, and Paul C. Stern. "The struggle to govern the commons." *science* 302.5652 (2003): 1907-1912.
[20]Rustagi, Devesh, Stefanie Engel, and Michael Kosfeld. "Conditional cooperation and costly monitoring explain success in forest commons management." *Science* 330.6006 (2010): 961-965.
[21]Savory, Allan, and Jody Butterfield. *Holistic management: a new framework for decision making*. Island Press, 1998.
[22]Savory, Allan, and Jody Butterfield. *Holistic management: a new framework for decision making*. Island Press, 1998.
[23]Briske, David D., et al. "Rotational grazing on rangelands: reconciliation of perception and experimental evidence." *Rangeland Ecology & Management*61.1 (2008): 3-17.
[24]Barnes, J.I., Cannon, J. & MacGregor, J. 2008. Livestock production economics on communal land in Botswana: Effects of tenure, scale and subsidies. *Development Southern Africa* 25(3): 327-345.
[25]Mendelsohn, John M. *Farming systems in Namibia*. RAISON (Research & Information Services of Namibia), 2006
[26]Mentz, Andre. "Holistic management in practice: grazing & crops." Stockfarm 1.1 (2011): 50-52.

that improved genetic composition via the introduction of foreign bulls may come at the expense of herd adaptability to local ecological context.[27]

Finally, a common response to poverty among rural livestock owners has been calls for greater coordination of, education about, and access to livestock markets.[28] However, critics argue that widespread informal markets, cultural biases against selling cattle, and poor cattle condition often impede such interventions.[29]

In short, programmatic responses to rangeland and livestock degradation remain anecdotally promising, but largely untested. Perhaps most glaring is the lack of rigorous evidence on the ability of outside interventions to promote improved community management in real world settings, and to build community capacity to sustain improved community management in the long-term.

3.3 External Support for Community-Based Natural Resource Management

Within the NCAs, the communal rangeland areas represent a vital natural resource to the surrounding communities. However, scholars vigorously debate the appropriate enabling conditions for effective community-based natural resource management. While past studies have demonstrated the possibility of successful communal land management,[30] they have also highlighted the challenges surrounding management of *open access* rangelands – i.e., areas lacking the institutions that would otherwise establish, monitor, and enforce management rules.[31] Scholars also debate the role of ethnicity, class, and age heterogeneity in promoting effective management, with inconclusive results.[32]

Another area of debate concerns the appropriate intervention *type* for inducing improved management practices. First, there is some evidence that communities can improve livestock and resource management given technical capacity building.[33] Second, practitioners emphasize the role of inducing a "mindset shift" in farmers towards a focus on long-term, sustainable environmental practices – although there is a dearth of evidence to support this approach.[34] Third, there is substantial evidence that material incentives can induce short-term behavior change (although there are concerns regarding the persistence of this effect).[35] Fourth, there is substantial evidence that communal institution-building is

[27] Mentz, Andre. *The Holistic Alternative - A Guide to Cattle Farming in Southern Africa*. Pula Books. 2009

[28] International Fund for Agricultural Development. *Republic of Namibia: Northern regions livestock development project.* Interim Evaluation. 2003. http://www.ifad.org/evaluation/public_html/eksyst/doc/agreement/pf/namibia.htm

[29] Lesorogol, Carolyn K. *Contesting the commons: Privatizing pastoral lands in Kenya*. University of Michigan Press, 2008.

[30] Ostrom, Elinor, James Walker, and Roy Gardner. "Covenants with and without a sword: Self-governance is possible." *The American Political Science Review*(1992): 404-417.

[31] Barrett, Christopher B. "Poverty traps and resource dynamics in smallholder agrarian systems." *Economics of poverty, environment and natural-resource use* (2008): 17-40.

[32] Adhikari, Bhim, and Jon C. Lovett. "Institutions and collective action: does heterogeneity matter in community-based resource management?." *The Journal of Development Studies* 42.03 (2006): 426-445.
Varughese, George, and Elinor Ostrom. "The contested role of heterogeneity in collective action: some evidence from community forestry in Nepal." *World development* 29.5 (2001): 747-765.

[33] Armitage, Derek. "Adaptive capacity and community-based natural resource management." *Environmental management* 35.6 (2005): 703-715.

[34] IRDNC. *Lessons from Field Work in Namibia*. 2010. http://www.irdnc.org.na/download/IRDNC%20-%20Lessons%20from%20the%20Field.pdf

[35] Wunder, Sven. *Payments for environmental services: some nuts and bolts*. Vol. 42. Jakarta: CIFOR, 2005.

necessary for sustaining long-term change – with little evidence to support the notion that effective institutions can be built in the short-term.[36]

Finally, there is an emerging literature on the use of behavioral games to study the importance of social cooperation and trust to sustaining effective management practices.[37] Research suggests that high levels of social cooperation, trust, and trust-in-leadership are important for effective communal resource management,[38] and that community-based interventions can also effectively improve social cohesion.[39]

3.4 Sustainability

A final fundamental question concerning community-based natural resource management has to do with sustainability. The core theoretical concern is whether there are multiple equilibria in communal resource management – one in which all individuals "defect" from cooperation and one in which all or most individuals cooperate to their mutual long-term economic advantage.[40] If multiple equilibria exist, the role of an outside intervention is simply to provide a "big push" to move communities from a defection-equilibrium to a cooperation-equilibrium. If, however, alternative equilibria do not exist, short-term "outside" interventions will fail to bring about sustainable change absent major structural change

Sustainability questions also surround specific aspects of community-based rangeland and livestock management. First, behavioral change has proven difficult to maintain absent social trust and institutional framework to monitor and enforce it.[41] Sustainable institutional development, in the form of community-based organizations, has demonstrated mixed success in the context of community resource management.[42] Furthermore, while there is evidence that development programs can induce short-term improvements in social trust and cooperation, little research has examined whether improvements last beyond the program implementation period.

We expect this study to meaningfully contribute to the various strands of literature mentioned above by introducing credible evidence to these discussions.

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[36]Humavindu, Michael N., PriyaShyamsundar, and Limin Wang. *Do Households Gain from Community-based Natural Resource Management?: An Evaluation of Community Conservancies in Namibia*. Vol. 3337. World Bank, Environment Department, 2004.
Ostrom, Elinor. *Governing the commons: The evolution of institutions for collective action*. Cambridge university press, 1990.

[37]Rustagi, Devesh, Stefanie Engel, and Michael Kosfeld. "Conditional cooperation and costly monitoring explain success in forest commons management." *Science* 330.6006 (2010): 961-965.

[38] Ibid
Kosfeld, Michael, and Devesh Rustagi. *Leader Punishment and Cooperation in Groups: Experimental Field Evidence from Commons Management in Ethiopia*. Working Paper, 2011.

[39]Fearon, James D., Macartan Humphreys, and Jeremy M. Weinstein. "Can development aid contribute to social cohesion after civil war? Evidence from a field experiment in post-conflict Liberia." *The American Economic Review* 99.2 (2009): 287-291.

[40]Barrett, Christopher B. "Poverty traps and resource dynamics in smallholder agrarian systems." *Economics of poverty, environment and natural-resource use* (2008): 17-40.

[41]Ibid

[42]Fabricius, Christo. *Rights, resources and rural development: community-based natural resource management in Southern Africa*. Earthscan, 2004.

4. Evaluation Design

4.1 Evaluation Type

MCC's monitoring and evaluation policies specify that an "Impact Evaluation" should include a credible and rigorously defined counterfactual, whereas a "Performance Evaluation" takes a non-experimental approach to answering descriptive and evaluative questions. This study is a *mixed methods* impact evaluation since it includes both a rigorous experimental evaluation component as well as a complementary qualitative component. The remainder of this report is structured accordingly.

4.2 Evaluation Questions

A major point of emphasis from all stakeholders involved in the CBRLM program is that the intervention is both multifaceted and dynamic. The program is multifaceted in the sense that it encompasses a wide number of intervention strategies, often with different target groups, exposure periods, and outcome measures. The program is dynamic in the sense that while the underpinnings of the intervention philosophy have remained fairly constant over time, the shapes of the intervention strategies themselves often change according to community feedback, resource availability, and macro-climatic conditions (e.g., long-term drought). Under these circumstances, our mixed methods approach is desirable since it affords us the flexibility of using either survey or qualitatively-sourced data where appropriate.

4.2.1 Policy Relevance

The evaluation questions at the core of this study are of both high domestic and international relevance. Support for community-based natural resource management in Namibia preceded the CBRLM program and is likely to extend beyond the life of the program. (At the time of writing, a number of GOPA personnel are working with Meatco Foundation on grant funding applications to the European Union to continue CBRLM-type activities post-Compact. At the same time, the Namibian Meat Board is laying the foundation for a farmer mentorship program focused on rangeland and livestock management practices.) Evaluation findings can help guide decisions by local policy-makers on the use of resources on similar efforts in the future.

As detailed in Section 3, international experience has left scholars divided on a number of policy issues related to CBRLM management. These include the correct enabling conditions ("open access" versus simply communal land; which socio-demographic characteristics are important; and what levels of social cooperation are necessary), the appropriate intervention type (technical support vs material incentives vs institution-building), and whether impacts are sustainable. Given the popularity of CBRLM management interventions among major international development agencies, the results of the current experiment are likely to influence not only the decision of whether to implement such interventions, but potentially *how* and *where* to implement as well.

4.2.2 Quantitative

MCC's Request for Proposals for this study listed four primary learning objectives. First, does CBRLM lead to improved rangeland and livestock management practices? Second, does CBRLM improve access to cattle markets? Third, does CBRLM increase the value of cattle production and sales? Fourth, does CBRLM increase household income? The following aspects of the learning objectives are sequential: improved practices and access to markets hopefully lead to improved offtake, and improved offtake

hopefully leads to increased household income. Using our Program Logic for this evaluation, we fine-tune this approach by narrowly defining all of the major programmatic channels through which CBRLM may impact the overall goals for this program. In total, we identify five such channels: Community Development, Rangeland Management, Livestock Management, Marketing, and Water.[43] Then, within each of these channels we further separate out the behavioral outcomes from what we call the physical outcomes. This makes sense because, with few exceptions, behavioral change is a necessary precondition for physical change. At the same time, from a practical point of view, the data collection strategies for our behavioral and physical outcomes are likely to differ (as discussed in Section 5.2).

4.2.2.1 Behavioral

Our behavioral, largely first-order evaluation questions – which span multiple programmatic channels in our Program Logic but are lumped together here for convenience – include but are not limited to:

- Do farmers practice (more) combined herding as a result of the CBRLM program?
- Do farmers practice (more) planned grazing as a result of the CBRLM program?
- Do farmers make (more) communal decisions as a result of the CBRLM program (e.g., attend Water Point Committee meetings or discuss when and where to move cattle)?
- Do farmers financially contribute (more) to communal actions (e.g. Water Point Committees, herder support efforts, vaccinations, or bull schemes) as a result of the CBRLM program?
- Do farmers increase the vaccination rate of their cattle as a result of the CBRLM program?
- Do farmers increase their sale of unproductive cattle as a result of the CBRLM program?

4.2.2.2 Physical – Household Survey

Again, the behavior changes listed above are almost all necessary *preconditions* for the physical changes that are expected to follow. But behavior change in and of itself may not be sufficient. Other activities, such as GOPA's improvement of auction facilities, investment in water infrastructure, provision of GA fund subsidies, and imparting of technical skills, may also be required to drive physical impacts. With this in mind, our key physical evaluation questions which might be measured by a household survey include but are not limited to:

- How is household wealth (from a likelihood model of whether the household resides in poverty using a short list of assets, including livestock and the quality thereof) impacted by the CBRLM program?
- How are household expenditures impacted by the CBRLM program?

4.2.2.3 Physical – Cattle Assessment

A number of key physical evaluation questions relate to cattle and are best answered through a cattle assessment. These questions include but are not limited to:

[43]The Capacity Building component, as defined in the Program Logic and not by GOPA, focuses on the human capital accumulation of GOPA staff rather than CBRLM intervention farmers. Therefore, it works more towards a continuation of the program than towards the sustainability of the program.

- How is the composition of cattle – including the portion of older, unproductive oxen (not used for draft power) — owned by farmer households impacted by the CBRLM program?
- How is cattle body condition score impacted by the CBRLM program?
- How are calving rates impacted by the CBRLM program?
- How are bull-to-cow ratios impacted by the CBRLM program?
- How is livestock loss impacted by the CBRLM program?

4.2.2.4 Physical – Rangeland Measurement

Finally, a number of key physical evaluation questions relate to the condition of the rangeland. These questions include but are not limited to:

- How is plant cover impacted by the CBRLM program?
- How is vegetation density and height impacted by the CBRLM program?
- How is overall bare ground cover and the incidence of large (>50cm) gaps between plants impacted by the CBRLM program?
- How is perennial grass density impacted by the CBRLM program?
- How is overall standing biomass impacted by the CBRLM program?
- How is the aggregate stability of biomass impacted by the CBRLM?
- How is herbaceous (grass and forb) litter impacted byy the CBRLM program?
  How is soil capping impacted by the CBRLM program?

4.2.3 Qualitative

IPA complements the core quantitative evaluation with qualitative data collection and analysis. The qualitative component is designed to inform choices about quantitative endline measures and methods, provide context for understanding causal mechanisms, and answer evaluation questions that are not amenable to quantitative analysis through the RCT framework. This section outlines the qualitative evaluation questions (or issue areas) of perceived importance by the research team. Note, however, that this list is subject to change based on continued stakeholder feedback as well as the findings from preliminary qualitative field work:

4.2.3.1 Mobilization and Project Take-up

The long-term success of the CBRLM program really begins with the success of the implementer's efforts to mobilize communities and get communities to take up the program during the Compact (though sustained practices in these communities post-Compact are also critical). Therefore, IPA will investigate mobilization and take-up efforts with an eye towards:

A. Identifying the factors that influence project take-up (e.g., community characteristics, headman characteristics);
B. Understanding how mobilization processes are affected by environmental, political, and socio-economic factors;
C. Understanding the relative effectiveness of different mobilization strategies (e.g., different types of incentives, education, and demonstration effects);
D. Examining the effect of the mobilization process on social dynamics in targeted communities.

4.2.3.2 Intervention

CBRLM seeks to shift both community attitudes and decision-making processes with regard to the five following topic areas: (1) rangeland management, (2) livestock management, (3) livestock marketing, (4) water management and use, and (5) financial management and community investments. The second thematic area will therefore seek to address:

A. To what degree has the project succeeded in:
    - Increasing awareness of the link between individual livestock production goals and the sustainable management of communal resources (e.g., water and rangeland)?
    - Improving community cooperation in the five topic areas (listed in the lead-in paragraph)?
    - Promoting decision-making processes surrounding the five topic areas that reflect principles of sustainable livestock and communal resource management?
    - Strengthening community-level governance (monitoring and enforcement) of livestock and communal resources?
B. What are the major obstacles to success in the five topic areas?
C. What project components (e.g., water support, the bull scheme, or co-operatives) generated changes in the five topic areas?
D. How have different environmental, political, and socio-economic factors affected the project's ability to generate changes in the five topic areas?
E. How do non-participating community members perceive and make decisions about the five topic areas?
F. How do communities define and think about "wealth", especially as it relates to their livestock production goals?
G. How has the project affected the way that participating farmers interact with neighboring communities as well as non-participating farmers?

4.2.3.3 Sustainability

According to the technical experts, meaningful CBRLM impacts are conditional on communities continuing to engage in rangeland and livestock management best practices following the end of the Compact. The qualitative evaluation component will therefore seek to understand which elements of CBRLM communities perceive to be the most [least] likely to be carried forward absent continued project support.

4.3 Methodology

To get an unbiased estimate of the impact of the project on the outcomes of interest, the evaluation uses a randomized controlled trial (RCT) to test the CBRLM intervention. Due to resource constraints, the CBRLM budget is not large enough to serve all potentially eligible areas. Therefore, the randomized trial itself is not expected to reduce the number of beneficiaries who would have otherwise participated in the program; rather, the randomized trial gave the eligible areas an equal probability of being offered the scarce resource, i.e. the CBRLM intervention. By randomly selecting treatment and control groups, this methodology allows us to make a *causal* statement about the impact of the program.

4.3.1 Unit of Randomization

Our unit of randomization in this study is the Rangeland Intervention Area (RIA). RIAs are essentially intervention zones that share a commonly agreed upon boundary and a common authority over what happens within the area.[44] Those RIAs selected to be part of the treatment group received the package of CBRLM activities while those RIAs selected for the control group did not (during the life of the Compact). Surveys measuring key variables will be implemented in the same manner for both groups.

To maximize statistical power as well as the number of areas that have a chance to participate in the intervention, GOPA was asked to identify as many eligible RIAs as possible. In their eligibility report, GOPA identified 41 such areas. During the design discussions, IPA learned that many areas were deemed ineligible for RIA status due to land conflicts and fencing. Some of these issues may be addressed by other activities in the Compact. If effective, the potential population for a scaled-up intervention ought to be larger than it is now. In addition, design discussions revealed that GOPA was unlikely to work with all of the communities within an eligible RIA for a variety of reasons, including poor water infrastructure, the existence of fences, and uncooperative factions within the larger community. As a result, GOPA ex-ante identified a subset of GAs within each RIA within which they expected to work in the first stages of the program. The purpose of identifying this subset of GAs was to leverage the budget for survey data collection to the greatest extent possible. (See Section 4.4.2 for further discussion of how these ex-ante identified areas relate to the revised sampling strategy.)

4.3.2 Sample Stratification and Balance Check

The 41 RIAs in our sample were randomly assigned to either Treatment or Control. For primarily political reasons, the RIAs were stratified on a single variable: affiliation with a Traditional Authority

[44] According to GOPA, some of the original RIA boundaries that followed easily-identifiable boundaries – such as roads, or borders of community forests – were incorrectly drawn. While such errors may be shored up without impacting the internal validity of the study, other borders may *not* be redrawn to accommodate instances where GOPA has taken to working outside of treatment RIAs. This issue was flagged by IPA to MCC in the first half of 2013. Endline data collection will be confined to the (shored-up) borders. In other words, final program impact analysis will not include CBRLM activities that occurred outside of the original RIA boundaries.

(TA). This was to ensure that at least half of every politically-sensitive TA was included in the CBRLM intervention. IPA then checked whether random assignment was correlated with any of the variables identified by GOPA as potentially important determinants of the intervention's success. If a nontrivial level of correlation was detected, we re-randomized the sample and then reran the balancing diagnostics until stratified, balanced lists were produced. The variables identified by GOPA, MCA-N and others during the evaluation design period, which were then balanced on, include:

- Traditional Authority
- Vegetation Type
- Number of households
- Number of cattle
- Cattle density
- Quality of water source
- Community Based Organization
- Overlap with complementary interventions

As a final step, a ceremony was conducted to randomly assign the balanced lists to Treatment and Control. We conduct t-tests on the final randomization which show that the two lists are indeed balanced on the observable variables listed above:

Vegetation Type	Flat Savannah	Forest	Grassland	Mopane
Control	3	9	2	6
Treatment	3	10	2	6

Log Households	(mean)
Control	133.7
Treatment	112.8

Number of Cattle	(mean)
Control	16,974
Treatment	15,794

Area in Hectares	(mean)
Control	884
Treatment	885

Water Quality	Poor	Good
Control	4	16
Treatment	5	16

CBO	(yes)	(no)
Control	15	5
Treatment	16	5

Overlap	(yes)	(no)
Control	7	13
Treatment	8	13

4.3.3 Measuring Social Cohesion

The concept of shared resources is particularly relevant for an intervention that requires collective action. As noted in Section 3.3, social preferences such as reciprocity, altruism, and fairness are widely considered to play a key role in outcomes like productivity and income despite the limited evidence to support this hypothesis. As part of this evaluation, we had planned to measure these attributes at both the beginning and end of the project, to allow us to test the general link between social preferences and poverty alleviation. More specifically, we had planned to use the baseline measures of social preferences to examine heterogeneous treatment effects – e.g. does the CBRLM program have a greater effect on individuals that are ex-ante more (less) trusting or more (less) altruistic? Unfortunately, this learning opportunity was lost when the baseline data became unusable within the framework of the RCT. There still exists, however, the opportunity to collect endline data to test whether the CBRLM program has the capacity to actually impact the study participants' social preferences. For example, do study participants demonstrate a greater level of reciprocity after having been explained the importance of collective action by GOPA? Such information would help to shed light on the channels through which the CBRLM program "works."

4.3.4 Outstanding Evaluation Design Issues

A key issue confronting this evaluation is project take-up. The statistical power calculations presented in Section 4.5 are based on the best available information concerning take-up to date. GOPA is attempting to collect regular data to assess, for example, the number of farmers that reliably practice planned grazing and combined herding. If the actual take-up rate is significantly lower than GOPA's estimations, we may be confronted by an under-powered study and thus Type II errors (i.e., false negatives).

Another key issue concerns the exposure period of the intervention. As we will discuss in Section 4.6, there is no consensus among the technical experts on how long program participants need to be exposed to the CBRLM program before detectable effects are able to manifest. Further complicating matters is the very real possibility that the optimal exposure period for some outcome measures extends beyond the life of the Compact. In other words, if we conduct endline data collection too early, we run the risk of missing impacts that only manifest later on. On the other hand, if we conduct endline data collection too late, we run the risk of missing impacts that do not persist… or else running into non-compliance (with treatment) issues due to external programs systematically moving into this study's control areas.

While CBRLM was conceived by MCC as a sustainable program with impacts persisting beyond the life of the Compact, it is entirely possible that some impacts might be realized in the short-run but might not persist thereafter. Weighing up the costs and benefits of investigating short-run impacts versus the persistence of these impacts is made more difficult by the not insignificant costs associated with each round of data collection.

4.4 Study Sample

4.4.1 Baseline Statistics

Unfortunately, as mentioned above, we will not be able to use the majority of the collected baseline data (i.e., a Baseline Household Survey and Cattle Assessment) in our final quantitative impact analysis due to insufficient overlap between the areas surveyed at baseline and the areas of implementation

(see Section 4.4.2 for more details). However, the data collected during these exercises still sheds valuable light on the populations in our study areas. The Baseline Household Survey was conducted between April and June 2011 and resulted in 2,964 household data points. While some of the definitions (e.g., "household") would need to be shored up and the number of transient herders captured in the data set is mildly problematic, the overall quality of the data is high enough to draw some meaningful insights into our sample population. The same goes for the Baseline Cattle Assessment, which collected information on 687 cattle-owning households and some 18,000 head of cattle.

Detailed information on the baseline characteristics of our study population can be found in the 'Findings from the Baseline Household Survey Report' and the 'CBRLM Cattle Assessment Baseline Report.' Among other things, these documents include information on the demographics of farmer households, the economic activities of farmer households, cattle offtake rates, cattle body condition scores and weight, herd composition, and the incidence of split herds.

4.4.2 Sampling Strategy

The original sampling strategy for data collection – i.e., the strategy that was followed at baseline – was ultimately deemed unviable due to insufficient overlap between the areas surveyed at baseline and the areas of program implementation. As a result, IPA has endeavored upon a revised sampling strategy, which was completed in 2014.

The original sampling strategy was based on GOPA's ex-ante expectations of where the organization would generally focus its early implementation efforts (i.e., the "green areas"). However, over the course of 2011 it became apparent that many of GOPA's *actual* implementation efforts were happening outside of these pre-identified areas. Therefore, in November of 2011, MCC and MCA-Namibia helped convene a series of meetings in which IPA and GOPA used ArcGIS mapping technology to roughly estimate the level of take-up in "green areas" versus non-"green areas" within treatment RIAs. The key take-away from these meetings was that the upper bound for take-up in "green areas" was approximately 25%, which fell well short of the 70% take-up rate upon which the initial statistical power calculations had been based.

In response to this finding, in March 2012, IPA devised a revised sampling strategy consisting of two parts:

- Objective Criteria Listing**:** The information that GOPA collected from key informants in 2010 clearly was not a good predictor of where the organization would ultimately focus its early implementation efforts. The revised sampling strategy can be thought of as an attempt to figure out what information GOPA *should have* based its predictions on back in 2010. In other words, it attempted to model how GOPA *actually* selected RIAs. To that end, the Objective Criteria Listing (OCL) process involved IPA staff visiting with a new wave of key informants – consisting mainly of GOPA field facilitators and local authorities – to collect information on a wide range of variables that seemed likely to hold predictive power for take-up.

- Household Mapping**:** Second, IPA staff collected from GOPA data on *actual* programmatic take-up in treatment GAs, which was current as of the end of the CBRLM sub-activity.

Next, IPA sought to establish to the best of its ability the relationship between these two sets of data. Specifically, the "objective criteria" characteristics were jointly used to predict the probability between 0 and 1 that a given Grazing Area accepted the CBRLM program. Any GAs with a score above a certain cutoff point were deemed "predicted," while any GAs below the cutoff were deemed "not predicted." The same criteria were then assigned to GAs within control RIAs to gauge which GAs would have been likely to take up the program in the event the RIA in which they reside had been selected into the treatment group rather than the control group. In other words, we used our model to form a valid counterfactual of the GAs that had scores above the cutoff in the control group areas.

In defining our "best" model, we took into consideration (1) statistical power and (2) balance between the "predicted" treatment and control GAs.

4.4.2.1 Statistical Power

The statistical power is the portion of time that a given minimum detectable effect (MDE) will be observed in the data we collect given the sample size and characteristics of the data. In an experiment with impartial compliance (i.e., not all units take up the program, such as in this case, where the model does not perfectly predict which GAs wound up being active CBRLM GAs) and with clustered randomization (as in this case, where randomization was done at the RIA level but the unit of interest is the cattle manager), the full equation to determine the minimum detectable effects is:

$$MDE = \frac{1}{(c-s)} \frac{t_{\alpha/2} + t_{1-k}}{\sqrt{P(1-P)J}} \sqrt{\rho + \frac{1-\rho}{n}}$$

where c is the share of households in the intention-to-treat group (i.e. our "predicted group") that actually took up the program, s is the share in control areas that took up the program (0 in all cases in this experimental design), $t_{\alpha/2} + t_{1-k}$ is the value of the t-tests that allow us to reject the null hypothesis that there is no effect of the program, P is the share of RIAs offered the program, J is the number of clusters included in the randomization, ρ is the intracluster correlation (that is, when measuring the variance of outcomes, the share of the variance that is explained by what cluster the unit of observation belongs to. In this case, it is the share of variance that is explained by what Grazing Area an individual belongs to), and n is the number of observations per cluster.

The final part of the equation, $\sqrt{\rho + \frac{1-\rho}{n}}$ depends on each variable, and in practice, is unlikely to change between various iterations of the model. Therefore, IPA's efforts to determine the best model from the perspective of statistical power is based on how to minimize: $\frac{1}{(c-s)} \frac{t_{\alpha/2}+t_{1-k}}{\sqrt{P(1-P)J}}$. The desired significance level and power $(t_{\alpha/2} + t_{1-k})$, and the share offered the program $\sqrt{P(1-P)}$ does not change between iterations of the model, meaning that the optimal model depends on two criteria, the compliance rate $(c-s)$ and the number of clusters J. In practice, this means that there are two (often offsetting) criteria that need to be weighed against each other—how accurate the model is at predicting whether or not a GA is active, and the total number of GAs the model predicts are active.

4.4.2.2 Balance

The other important element in choosing the best available model is the degree of balance, between treatment and control, on the observable characteristics used in the model. Because RIAs were chosen by way of randomization we would like, in expectation, for the characteristics in the treatment and control groups to be similar. However, due to the relatively small number of RIAs in our study, the threat of imbalance was not insignificant. Therefore, we endeavored to select a model that produced *balanced*, predicted treatment and control groups.

Our "best" model included the following OCL characteristics:

Environmental	Community Level	Leadership Variables	Income / Wealth
• Water Installation • Carrying capacity of land above/below median	• Community's Readiness to Change • Community's Degree of Social Cohesion • Spillover from Neighbors a Potential Problem • Quality of herders • Herder turnover • Himba presence	• TA's Readiness to Change	• Cell Phone Coverage • Housing Material: Mud/Clay/Brick

4.5 Minimum Detectable Effects

The "best" available model described above includes 123 total Grazing Areas. All eleven of the variables in this model are balanced at the 5% significance level. Of the 123 total GAs, 71 GAs are in the predicted treatment group and 52 GAs are in the predicted control group. The 52 predicted treatment GAs are comprised of 37 active CBRLM GAs and 14 GAs that are not a part of CBRLM. The predicted sample from which the study will collect data does not include 21 active CBRLM GAs that were "not predicted."

Using the formula discussed in Section 4.4.2.1 and data from the baseline household survey and baseline cattle assessment data collection efforts, we estimate the adjusted minimum detectable effect sizes for the following key variables:[45] [46]

- Number of cattle cared for 0.25
- Total value of cattle 0.32
- Number of calves born, last 12 months 0.23
- Number of cattle sold, last 12 months 0.25
- Number of cattle in the home 0.21
- Total income 0.33
- Total work experience 0.35
- Dummy: combines herds 0.33
- Calving rate 0.32
- Cow-to-bull ratio 0.33

4.6 Timing of Data Collection

4.6.1 Exposure Period

In 2013, IPA received feedback from eleven experts on appropriate timing for endline data collection. (See Appendix B for a summary of the results.) The key tension in almost all responses was:

- Drought, slow program roll-out, and the naturally slow development of many key outcome measures may make it difficult to detect impacts by 2014.
- Program impacts may start to deteriorate by 2015 absent external support.

The survey revealed two general trends:

- Behavioral outcome measures are considered achievable by 2014, while there is less of a consensus around the exposure period for other (non-behavioral) outcome measures.
- With regards to the other (non-behavioral) outcome measures:
    - GOPA staff tended to prefer 2014 due to fears or program impacts starting to deteriorate by 2015 absent external support.

[45] The Baseline Data represents our most reliable estimates of the mean and variance for our key outcomes of interest.

[46] See the CBRLM Cattle Assessment Baseline Report for detailed definitions of these Outcome Measures.

- External experts tended to prefer 2015 due to fears of drought, slow roll-out, and the naturally slow development of many measures making it difficult to detect impacts by 2014.

4.6.2 Season

IPA also consulted with key project implementers and stakeholders about the appropriate season for behavioral data collection. GOPA project experts proposed two ideal candidates for data collection: the May-June period, immediately following the rainy season, and the October-November period, at the end of the dry season. In addition to the 'exposure period' reasons listed above, IPA selected the October-November period of 2014 as the best option for behavioral data collection for the following reasons:

- One of the most important outcomes of interest identified by project stakeholders is the implementation of planned grazing and combined herding (PGCH) over *consecutive* growing and non-growing seasons.[47] By collecting data in October-November, we are able to assess the cumulative effect of PGCH activities during the combined growing and non-growing seasons.
- GOPA experts indicated that most GOPA *and* non-GOPA farmers engage in basic PGCH activities during and immediately following the growing season.[48] If this is true, the variance of PGCH activities during the May-June period would be lower, thus making it potentially more difficult to measure a statistical difference between treatment and control.
- While PGCH activities are less likely in the dry season, GOPA rangeland experts indicated that *year-round* adherence to PGCH principles is a prerequisite for sustained impact on rangeland and livestock.[49]
- The October-November period is an optimal time of year to measure changes in livestock management practices among participating farmers because it is the season when farmers are more likely to deal with undernourished and sick cattle.[50]
- The October-November period is also an optimal time of year to measure changes in livestock marketing behavior because farmers are expected to offtake livestock in response to declining fodder availability before and during the non-growing season.[51] Given the recall challenges for questions related to livestock sales, capturing marketing activities *at or near* the time of sale is important for data quality assurance.

[47] Referenced by Colin Nott and Helmke Von Bach in August 2013 during a group discussion of endline measures at Oshandira Lodge.

[48] Johannes Beck in August 2013 during a discussion of endline measures at GOPA offices.

[49] Colin Nott in May 2013 during a discussion of the drought response in Opuwo.

[50] From a group discussion in August 2013 on endline measures at GOPA offices.

[51] Edmore Masaire and Erdwin Muradzikwa in August 2013 during a group discussion of endline measures at GOPA offices.

5. Data Sources and Outcome Measures

5.1 Existing Data Sources and Outcome Measures

The existing data sources are unlikely to feed directly into the regression analysis within the RCT framework. However, both the existing quantitative and qualitative data sources listed below should help us refine the measures used in our analysis, as well as lend context to the results of our analysis.

5.1.1 Quantitative, Existing Data Sources and Outcome Measures

We have identified five sources of existing, quantitative data that has the potential to inform the evaluation:

- The two databases collected during the 2011 baseline will be valuable for guiding endline data collection. The Baseline Household Survey will assist in generating endline outcome measures (including the development of a new aggregate wealth measure) and performing power calculations. Additionally, the Baseline Behavioral Games section will inform endline outcome measures related to behavioral and attitudinal change.

- Namibia's 2011 *Population and Housing Census* data includes information on population density, regional demographics and socio-economic development, and infrastructure like water points, schools and auction sites. This data have already been used to inform the revised evaluation sample, and may be used in interpretation of endline analysis as well.

- Namibia's *National Household Income and Expenditure Survey* offers granular data on household consumption, income and living standards. The Namibian government collected the NHIES in 1993/1994, 2003/2004, and 2009/2010. The NHIES data can help inform the creation of endline household income and wealth measures.

- Village-level data collected by DEES officials on water consumption and cattle numbers may provide a useful quantitative backdrop to analysis of those areas. It remains to be seen whether this information is sufficiently comprehensive to inform project-wide quantitative analysis.

- Two non-governmental datasets may be used for descriptive purposes: Rainfall, biophysical, and water availability data are collected and stored by researchers at the University of Namibia; and the Meat Corporation of Namibia (MEATCO) offers data on regional and national cattle prices.

5.1.2 Qualitative, Existing Data Sources and Outcome Measures

These three sources of qualitative data have the potential to inform the evaluation:

- In 2013, IPA participated in a three-day seminar on interdisciplinary approaches to the conservation of Namibian common pool resources at the University of Cologne. The seminar included several experts in qualitative research, including University of Cologne anthropologists Michael Bollig and Clemens Grenier and University of Washington St. Louis anthropologist Carolyn Lesorogol. These researchers, along with Georgetown historian Meredith McKittrick, have been open to sharing previous qualitative research and experiences in qualitative evaluations of development projects in Northern Namibia.

- In 2013, IPA also participated in the Namibia Rangeland Forum, which focused on community-based rangeland management. The forum included several rangeland scientists and practitioners focused on qualitative evaluations of holistic rangeland management programs. Two researches in particular, Richard Haddock of Natural Capital in Kenya and Jacques Van Rooyen of the University of Pretoria, provided valuable information in this area.

- The IRDNC has shared its own qualitative "lessons learned" for its CBNRM projects in northwest Namibia. These lessons provide valuable insights into rangeland change process and suitable qualitative evaluation methods/techniques.

5.2 New Data Sources and Outcome Measures[52]

5.2.1 Quantitative, New Data Sources and Outcome Measures

In Section 4.6 we chronicled the split opinions from technical experts on *when* we should conduct quantitative endline data collection. In Section 4.2.2 we explained how many of the behavioral changes we look to measure are preconditions for change in our physical outcome measures. In an effort to appease both camps in the "timing" debate as well as protect MCC from unnecessary spending (in the event we find no or very little behavioral change), we outline a two-step approach to quantitative, endline data collection.

5.2.1.1 Behavioral, Quantitative, New Data Sources and Outcome Measures

First, we propose collecting behavioral measures around October 2014 as part of a scaled-down survey effort that also doubles as a listing exercise for potential further data collection. This behavioral survey would be relatively short in length, focusing on a limited number of behaviors that we consider necessary (but not sufficient) for driving change in our set of "physical" outcome measures. A preliminary list of these behavioral questions is included in Section 4.2.2.1.

5.2.1.2 Physical, Quantitative, New Data Sources and Outcome Measures

If we find positive behavioral impacts from the first round of data collection detailed above, we propose collecting *physical* outcome measures, potentially in October 2015. This second round of endline data collection may include one or more of the following components: a cattle assessment, detailed questions concerning household finances, behaviors, and knowledge, and/or a rangeland assessment. (See Section 4.2.2.2 for a preliminary list of the physical outcome measures we plan on collecting.)

Due to a longer survey instrument, plus the complexity of either assessing cattle or measuring rangeland, we anticipate a second round of data collection being significantly more expensive and time-consuming than the first round of behavioral data collection. The significant costs that would be associated with an endline cattle assessment, endline rangeland assessment, or any other collection of *physical* outcome measure motivate for a careful cost benefit analysis prior to embarking on such an effort. Below, we present some factors that would feed into the cost-

[52] Appendix D presents an estimate for the total budget for the evaluation.

benefit calculation of any type of data collection effort, and then we present some factors that are specific to particular data collection efforts:

- *Outcome of Behavioral Analysis.* It is highly likely IPA will recommend forgoing cattle, household, and rangeland assessments if the behavioral assessment does not discover sufficient change in the related behaviors to produce measurable effects on the outcomes listed in Section 4.2.2.

- *Relative Value of Data Type:* The evaluation will consider the value of cattle, household, and rangeland data in light of the Program Logic.

Cattle Assessment

The evaluation team is actively considering an endline cattle assessment, to be conducted most likely in October 2015 or April/May of 2016. Unfortunately, as discussed in Section 4.4.1, the revisions to our sampling strategy have rendered the data from the baseline cattle assessment largely unusable within the context of the RCT analysis. However, the evaluation team still took away many operational lessons from this experience. These experiences feed into the calculation of whether the value of information generated by a cattle assessment would outweigh the costs of data collection and analysis. Factors include:

- *Data Collection Costs:* The hardware and manpower used for the baseline cattle assessment were largely appropriate for the task. Specifically, to assess what was ultimately the herds of 687 households (out of a target of 901 household herds), the survey implementer, AgriEnviro Consultants assembled seven survey teams, each consisting of a supervisor, an enumerator, and three cattle handlers; each team was outfitted with a vehicle, a mobile crush pen, an electronic scale, and a netbook; and the entire operation was overseen by two survey managers, took five weeks, and achieved a response rate of 76%. While we would ideally keep the same basic team structure intact for endline data collection, all of the figures presented above would need to be scaled up to account for the larger required sample size and higher required response rate.

- *Data Collection Feasibility:* The second key take-away from the baseline cattle assessment is that spilt herds pose a major problem. In this case, we define "split herds" as the distribution of one owner's cattle into multiple herds, possibly spread out over large distances. This notion is supported by anecdotal evidence as well as discrepancies between the number of cattle assessed and the self-reported number of cattle owned. Therefore, prior to endline data collection, we recommend putting a great deal of effort into both identifying, and making arrangements to accommodate, split herds. This process would begin with the 'listing exercise' portion of the behavioral outcomes data collection effort in 2014.

Household Survey

The evaluation team is also actively considering an endline household survey, which would also be conducted most likely in October 2015 or April/May of 2016. As with the baseline cattle assessment, the baseline household survey will be unusable given changes to the evaluation

design. However, experiences with the baseline household survey and behavioral survey have implications for the decision to undertake an endline household survey. These factors include:

- *Data Collection Costs and Feasibility:* The baseline household survey was contracted to successfully target 2,697 households, and wound up having a 78% response rate. The evaluation team would likely seek to increase the targeted sample and increase the response rate to ensure sufficient statistical power. IPA's recently concluded behavioral survey offers a useful framework for doing so. The behavioral survey used four survey teams (Kunene North, Omusati/Oshana, Ohangwena/Oshikoto, and Kavango East/Kavango West), each with a regionally-tailored data collection strategy. The effort achieved a full listing of all kraals in targeted grazing areas and a 98% response rate. A pre-listing of all kraal names, locations, and phone numbers would substantially aid a household survey effort. However, the household survey would need to target households rather than kraals. (Kraals are comprised of an average of three and as many as ten participating households.)

  A further complication to household data collection is the presence of hard-to-reach households. In both the household baseline and behavioral data collection efforts, many cattle-owning households were located in Namibia's southern cities (Windhoek, Walvis Bay, and Swakopmund). These households present a major logistical challenge.

- *Trust and Public Goods Games*: The baseline household survey included a behavioral games component, designed to measure underlying social factors such as social cohesion, trust in leadership, and commitment to public goods. Although this baseline data cannot be used in IPA's endline analysis due to changes to the evaluation structure noted above, endline behavioral data may be useful in its own right. Specifically, if the qualitative and behavioral components reveal meaningful changes in measures of social cohesion, trust, and trust in leadership, then an additional behavioral games component may be warranted to provide additional social outcome measures.

- *Validity of Endline Measures:* One concern with the baseline household data was whether income and consumption were appropriate metrics for programmatic success. These metrics may fail to capture assets valued highly by Namibian households for cultural reasons, such as cattle wealth or stocks of mahangu. As such, in addition to income and consumption measure, the evaluation team will also consider an aggregate wealth measure, which would be based on the household assets commonly held by "wealthy" households. IPA could use qualitative analysis to help inform the development of this measure.

<u>Rangeland Assessment</u>

The evaluation team is actively considering a rangeland assessment, to be conducted most likely in October 2015 or April/May of 2016. This decision will be made based on a calculation of whether the value of information generated by a rangeland assessment would outweigh the costs of data collection and analysis. Relevant factors include:

- *External Factors Influencing Rangeland Outcomes*: It is possible that, even if CBRLM measurably impacted rangeland behaviors, external factors like rainfall shortages and wildfires may impede measurable progress in the rangeland condition of CBRLM grazing

areas vis a vis non-CBRLM areas. If the evaluation team, in consultation with project stakeholders and area experts, determines that external factors have sufficiently limited the likelihood of rangeland improvements, IPA is unlikely to recommend an endline rangeland assessment component.

- *Power Calculations and Effect Sizes:* While the evaluation team does not have quite as clear a basis for estimating effect sizes and running power calculations for the rangeland component as it does for the cattle and household components, newly available data should make these processes more feasible. In early 2015, MCA/MCC consultant Jeff Herrick made publicly available rangeland data from a complementary study in the NCAs that examined similar outcomes of interest (e.g., foliar cover, bare ground, litter, etc.). From a power calculations perspective, the availability of this data is promising. However, a rangeland component is still challenged by the fact that the relatively scarce available literature on rangeland interventions offers widely varying estimates of likely impacts and does not include any rigorous studies of comparable to the project under evaluation. At the same time, high variance in the biophysical characteristics of the land in the NCAs may also negatively affect the precision of impact estimates.

- *Data Collection Costs and Feasibility:* While IPA did not conduct a rangeland assessment at baseline, rangeland assessments in Namibia and elsewhere have proven feasible.[53] Previous studies have employed both aerial imagery and on-site collections of rangeland data. A rangeland assessment for the intervention under study would, however, be much larger than most current studies due to the scope of the intervention and the power calculations requirements of the evaluation.

5.2.2 Qualitative, New Data Sources and Outcome Measures

The qualitative evaluation component consists of multiple subcomponents, each of which addresses a different research question that is not amenable to the RCT framework.

5.2.2.1 Focus Groups

The core of the qualitative evaluation is focus group discussions overseen by trained moderators and note-takers. Each focus group discussion includes roughly 6 to 12 individuals from two (and sometimes three) proximate GAs to ensure broad representation and provoke conversation about different experiences. Moderators use a focus group script with between 10 and 15 questions (i.e., 120 to 160 minutes-worth of questioning), including pre-designed probes to elicit deeper discussion about key issue areas.

All interviews are audio-recorded, with a note-taker noting key observations about tone and atmosphere. An emphasis is placed on ensuring broad participation and letting respondents determine the direction of the discussion. The focus group discussions consist of:

A. *Participating Farmers in Active Grazing Areas*

[53] Pyke, David A., et al. "Rangeland health attributes and indicators for qualitative assessment." *Journal of range management* (2002): 584-597.

- Target Group: Livestock owners in active Grazing Areas who maintained participation in the project.
- Exclusion Criteria: GA Committee member or Traditional Authority.
- Objective: Understand community perceptions of programmatic mobilization, implementation, and sustainability.

B. Non-Participating Farmers in Active Grazing Areas

- Target Group: Livestock owners in active Grazing Areas who did not participate in the project.
- Exclusion Criteria: Traditional Authorities.
- Objective: (1) Understand perceptions of non-participating community members of mobilization processes and project activities. (2) Determine likelihood of future mobilization. (3) Understand non-CBRLM livestock and rangeland management practices.

C. GA Committee Members in Active Grazing Areas

- Target Group: GA Committee members in active Grazing Areas who did not participate in the project.
- Exclusion Criteria: Traditional Authorities.
- Objective: (1) Understand the mobilization and implementation processes from the perspective of community leaders. (2) Understand the structure of community decision-making and enforcement in CBRLM areas.

5.2.2.2 In-Depth Interviews

The qualitative component also includes six in-depth interviews (two per regional grouping) with Senior or Village Headmen who rejected the project. These one-on-one interviews are designed to elicit information about the mobilization process and community decision-making processes in non-GOPA-implementation areas. In-depth interviews include roughly 18 to 20 questions and last approximately 30 to 45 minutes. The headmen respondents are selected based on discussions with GOPA about key players in the mobilization process, subject to availability constraints.

All interviews are audio-recorded, with a note-taker noting key observations about tone and atmosphere. An emphasis is placed on ensuring broad participation and letting respondents determine the direction of the discussion.

D. Traditional Authorities in Inactive GAs

- Target Group: Traditional Authorities (Senior Headmen or Local Headmen) who rejected the program
- Exclusion Criteria: Headmen in areas where project was not offered. Headmen who accepted the project. Headmen who are not familiar with the project.
- Objective: (1) Understand the mobilization and implementation process from the perspective of community leaders (2) Understand the structure of community decision-making and enforcement in non-CBRLM areas.

6. Analysis Plan

In this section, we present the broad principles of our quantitative and qualitative analysis strategies. However, the fine details of the Analysis Plan will depend on what data is ultimately collected.

6.1 Quantitative Analysis Plan

6.1.1 Approach to the Quantitative Portion of the Analysis Plan

This study employs an RCT design in an effort to remove the possibility of selection bias. Assuming our sample is of adequate size, the livestock-owning households in our treatment and control groups ought to differ in expectation only through their exposure to the CBRLM intervention. Therefore, our analysis should yield an unbiased estimate of the impact of the CBRLM program within our sample of RIAs – i.e., we should be able to obtain what is called an "internally valid" estimate. (The statistical power calculations used to determine what constitutes an "adequate sample" are discussed in Section 4.5.)

To help unpack our quantitative findings, we have developed a Program Logic and supplemented our results with qualitative findings. As explained in Duflo, Glennerster, and Kremer's *Randomization Toolkit*: "Results from randomized evaluations provide reduced form estimates of the impacts of the treatment, and these reduced form parameters are total derivatives. Partial derivatives can only be obtained if researchers specify the model that links various inputs to the outcomes of interest and collect data on these intermediate inputs. This underscores that to estimate welfare impact of a policy, randomization needs to be combined with theory."

As is the case with many RCTs, we do not anticipate the CBRLM program being taken up by every household across our twenty-one treatment RIAs. However, in order for our study to be valid and to prevent the reintroduction of selection bias, our analysis needs to focus on the groups created by the initial randomization. In other words, we need to compare those *initially* allocated to the treatment group to those *initially* randomized to the comparison group, regardless of their (or GOPA's) actual behavior. Therefore, we employ an ITT analysis approach.

In many RCTs, the ITT estimate is actually the parameter of primary interest. This is often the case when policymakers want to estimate the effectiveness of a program that will inevitably fall short of full coverage (e.g., school-based deworming). However, in other cases, the effect of the intervention (T) itself, rather than that of the instrument, is of chief concern. This is particularly true of interventions that are not designed to be scaled up as policies but rather used to deepen our understanding of what *could* be delivered in another fashion or another setting, etc. For this evaluation, we assume both the ITT and T estimates to be of interest to stakeholders.

For the actual regression analysis of our data we will use Stata statistical software. This analysis will take place following each round of endline data collection, cleaning, and formatting. We expect to adjust for the fact that we will be testing a large number of hypotheses as well as multiple related hypotheses (i.e., families of hypotheses). However, our exact adjustment approach (e.g., a Bonferroni adjustment) has yet to be decided. Finally, we do not anticipate having sufficient statistical power for in-depth subgroup (or heterogeneous) analysis.

6.1.2 Specifications for the Quantitative Portion of the Analysis Plan

Using survey data, as discussed above, we will employ an ITT analysis approach to produce an unbiased estimate of the average treatment effect with the Ordinary Least Squares specification:

$$Y_i = \alpha + \beta_1 * T_i + \beta_2 * X_i + \varepsilon_i$$

where Y_i denotes our dependent variable, also referred to as our "outcomes of interest" or "outcome measures" throughout this document. The primary *behavioral* dependent variables include measures of: combined herding, planned grazing, communal decision-making, financial contribution towards communal decision-making, vaccination rates, and offtake of unproductive cattle. The primary physical dependent variables include measures of: household wealth, household expenditures, number of cattle owned, cattle body condition score, the calving rate, the bull-to-cow ratio, and the portion of older, unproductive oxen (not used for draft power) as a proxy for herd structure. While the regression analysis will focus on these primary dependent variables, the analysis will also include a large number of secondary, related measures.

On the right-hand side of our equation, $T_i$is a dummy variable which takes the value 1 if individual i lives in a RIA assigned to the treatment group. Therefore, the average treatment effect is captured by β_1. Since we stratified the randomization by "affiliation with a TA", we include $X_i$as a vector of control variables including demographics and this stratification variable. The robust error term ε_i is calculated allowing for clustering at the RIA level, which is the unit of randomization. Due to limited statistical power, it is unlikely we will be able to detect any heterogeneous treatment effects, although these will be explored.

6.2 Qualitative Analysis Plan

As discussed earlier, the qualitative component of our study serves three functions. First, it helps inform the appropriate questions and measures for the quantitative component. Second, it provides context to the measured causal relationships of the quantitative component. Finally, it helps answer evaluation questions not amenable to the RCT framework.

The first steps in analysis of the qualitative component is developing and applying a coding scheme for interpreting focus group, in-depth interview, and semi-structured observation data. Coding typically requires the analyst to read the data and demarcate segments within it, with each segment labeled with a "code" – usually a word or short phrase that suggests how the associated data segments inform the research objectives. Using specialized qualitative analysis software, we anticipate having two trained staffers code our collected qualitative data. The second step of analysis involves reporting on the identified codes, including summaries of prevalence, discussions of similarities and differences across contexts, and comparison of the relationships between one or more codes. We will use a combination of the trained staffers and the Qualitative Evaluation Expert, to report on the identified codes.

We expect that qualitative analysis will occur primarily in the fourth quarter of 2014 and the first quarter of 2015, following the completion of qualitative data collection. This data collection effort will result in a qualitative report focused mostly on processes and, more substantially, a combined report on qualitative and quantitative (from the behavioral data collection process) findings.

7. Monitoring Plan

In addition to IPA's ongoing monitoring, the project has benefited from three additional monitoring efforts. First, GOPA worked with project-supported cooperatives to collect data on cooperative-run auctions during the project period. This collected data offer valuable insight into the timing, prices, and total sales at these auctions. It also attempts to chart the percentage of cattle sold from project areas.

Second, GOPA completed mid-term internal monitoring of key project demonstration sites in 2012. The exercise focused on thirteen "demo areas" and consisted primarily of survey responses (delivered to GOPA staff) from participant farmers.

Finally, GOPA conducted a more comprehensive internal monitoring exercise in December 2013. As part of this effort, GOPA staff assessed progress toward a broad set of project goals based on interviews with GA Committee members, herders, and Farmers, as well as reviews of GA Committee records and Grazing Plans. The specific topics covered in this exercise included: the extent and duration of PGCH; community decision-making processes; GA Committee structure, effectiveness and accountability; herd restructuring and livestock management; program sustainability; infrastructure development; and key successes and challenges.

8. Limitations and Challenges

As discussed above – particularly in Section 4.3.4 – this evaluation faces a number of significant challenges. Two of these challenges stand out above the rest and are re-summarized here. Firstly, despite the successful implementation of the revised sampling strategy, this evaluation still does not enjoy an abundance of statistical power to detect programmatic impacts. This is due to the relatively

small sample of just forty-one geographic clusters (due to a combination of political and practical concerns) as well as the absence of usable baseline data. Project take-up is also a concern. So, while the evaluation *is* sufficiently powered to reach the desired MDEs if current assumptions hold, the margin for error is small.

Secondly, the exposure period has proven to be a complex issue. For many of our key outcome measures, there is no consensus among experts as to the required exposure period to achieve outcome measures for the CBRLM program. This uncertainty is only compounded by the multi-year drought that has affected the western portion of the study area particularly hard. What little agreement there is tends to reflect the opinion that our behavioral outcome measures will manifest before our physical outcome measures. Therefore, the optimal exposure period for most physical outcome measures is well into the post-Compact period when, according to some experts, impacts may have already started to deteriorate (assuming no sustained programmatic support that adheres to the random assignment statuses of this study).

In addition to these significant challenges, there are also issues around the redrawing of RIA boundaries, the definition of "household" for data collection purposes, the data collection challenges posed by split herds, and the political challenges of data collection in the post-Compact era.

Although IPA is employing some measures to address each of these challenges, there are no easy solutions. Firstly, in an effort to address the statistical power concerns, we are monitoring – as best we can – how closely our assumptions (in particular, project take-up) reflect the reality on the ground. Secondly, in response to feedback related to the optimal exposure period, we have employed a two-step approach to endline data collection that focuses first on behavioral outcome measures and second on physical outcome measures.

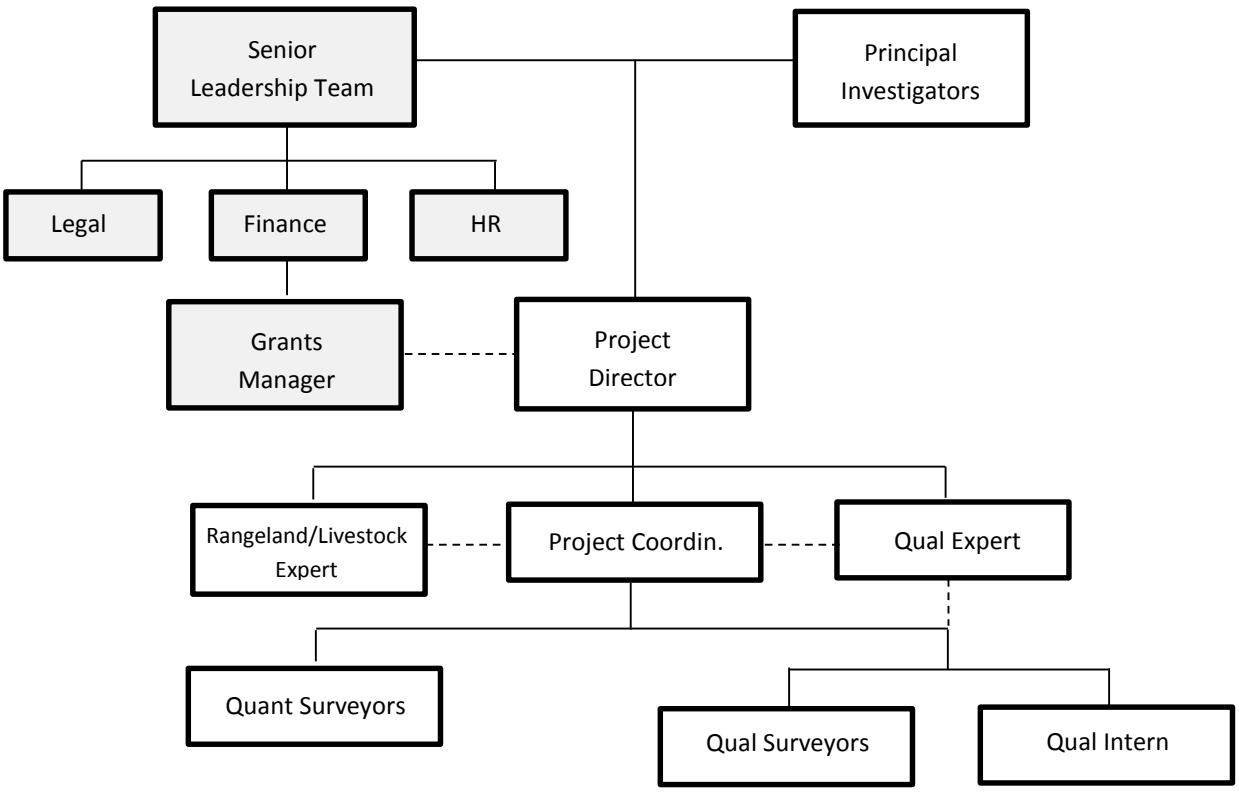
9. Administrative

9.1 Institutional Review Boards

This project first received approval from IPA's Institutional Review Board (IRB) on March 3, 2011, prior to baseline data collection (IRB Protocol #253.11March-001). IPA IRB approval is required for IPA projects, of which this is one. This IRB approval was subsequently renewed on February 14, 2012, on September 9, 2012, and on February 1, 2013. Likewise, the project received approval from Yale University's Human Subject Committee on March 24, 2011 (IRB Protocol #: 1103008148). Yale IRB approval is required for projects led by Yale researchers, of which Dr. Karlan is one. This IRB approval was subsequently renewed on March 22, 2012. In February 2014, the research team submitted an updated IRB approval request that reflected the sampling strategy developments as well as the potential qualitative component. Further IRB requests are made as key aspects of the study are planned or refined.

9.2 Evaluation Team Roles and Responsibilities

The basic organizational chart for this evaluation is as follows:



The project employs one Project Director who spends a majority of his time on the project. This person's responsibility is to oversee all aspects of the evaluation and solicit input from the Principal Investigators on technical matters. He visits the project site up to three times a year around key activities, such as trips to Namibia by DC-based MCC staff, the launch of new data collection efforts, summits, or other key partner meetings. One full-time Project Coordinator is usually based in country – either in Windhoek or Ondangwa – and manages day-to-day field operations. Specifically, he or she is responsible for keeping close communication with GOPA and other key stakeholders (e.g., MAWF and DEES), organizing field data collection, and reviewing all project-related documentation (e.g., GOPA Quarterly Reports).

The Principal Investigators, Project Director, and Project Coordinator are backstopped by a New Haven-based Grants Manager who takes the lead on invoicing and other contractual matters. IPA head office also provides legal, human resources, research, and other administrative support as needed. The project employs external technical experts (i.e., Subcontractors) as needed. This includes experts on rangeland and qualitative evaluation techniques.

9.3 Timeline

As discussed in Section 5.2, the evaluation team proposes first collecting behavioral data in late 2014, and then collecting physical outcome data in late 2015. If, however, these efforts in 2014 reveal that

very little behavior change has occurred, plans for the 2015 quantitative data collection and what further investigation is warranted will need to be reassessed. Concurrent to these processes, the project will include a qualitative data component which will be conducted in the second half of 2014. Therefore, the key events going forward may include:

- 2014, Q3: Begin Qualitative Evaluation Component;
- 2014, Q4: Implement Endline Behavioral Data Collection;
- 2015, Q1: Qualitative Data Collection Report on Processes;
- 2015, Q2: Behavioral Data Collection Report;
- 2015, Q3: Complete additional Qualitative Evaluation Component;
- 2015, Q4: Implement Endline Physical Data Collection; and
- 2016, Q1: Draft Endline Evaluation Report.

9.4 Data Preparation and Access

This evaluation adheres to MCC's guidelines for public use of data. Under this set of guidelines, data sharing is meant to ensure potential replication of evaluations assessing the impact of MCC's projects, as well as inform future data-gathering and research efforts. In keeping with these guidelines, baseline data was made available as soon as it was compiled and cleaned. Going forward, data subsequently collected and the corresponding documentation will be made available together with related reports on findings.

All data-related documentation, including questionnaires, codebooks, and training manuals, will be made available in PDF format. The quantitative data itself will be in Stata format. Finally, in keeping with the Human Subjects regulations described above and guidance from MCC's Disclosure Review Board, the public use data files created for this evaluation will be free of identifiers that may permit linkages to individual respondents or their household members, as well as variables that could lead to deductive disclosure of the identity of individual subjects.

9.5 Dissemination Plan

The results of this study will be presented at MCC in Washington D.C., and to stakeholders in Namibia. In addition to evaluation reports prepared as contract deliverables, we plan to produce the following outputs from this study: one or more academic papers published in peer-reviewed journals, a policy brief, project summaries posted on the IPA and J-PAL websites, a project description in the IPA annual report, and presentations at relevant conferences. Dean Karlan and Julian Jamison have extensive experience publishing in academic journals, including papers in *Econometrica*, *American Economic Review*, and *Quarterly Journal of Economics*. At the same time, IPA studies are typically accompanied by a policy paper or included in a (J-PAL) policy brief, each of which is made available on the IPA or J-PAL website and also widely distributed. We anticipate the results of this study being of particular interest to policymakers with ties to community-based natural resource management programs.

Appendix A: Program Logic

	Inputs	Activities	Outputs	Outcomes Short-term (less than one year after activity)	Means of verification	Outcomes Mid-term (until the end of the current program)	Means of verification	Outcomes Long-term (after the end of the current program)	Means of verification	Overall goals
Community Development (GA level)	12.5 mil. US $	• Identify Grazing Areas (GAs) • Mobilize GA communities, form GA committees • Promote inclusion of women in management • GA-level training: o CBRLM principles PGCH: Develop land use, grazing and fire management plans o Livestock + Marketing o Leadership & decision-making + professional herder training o Bookkeeping o Waterpoint infrastructure design & maintenance • Promote GA fund, provide matching contributions • Encourage formation of GA clusters • Organize community exchange visits	• Household inventories recorded (1500 households registered and participating) • GA committees established • GA agreements signed (MoU) • Communities trained in the different thematic areas • Livestock marketing plan produced • Female representation in GA committees • GA books created and updated regularly • GA funds established, bank accounts opened	• GAs organize themselves • GA committees operative with GOPA support • GAs use GA books as a management and bookkeeping tool • GA fund fed by the GA community and used to pay for herders, infrastructure and fuel	• Payment for herders • Support for herders - protective equipment • Herder Training • Herder Turnover • Up-to-date GA Books • Community-financed herders, infrastructure and vaccinations • Qualitative assessment of decision processes	• GA committees functioning autonomously • Improved leadership in GAs (Leadership role assumed by GA committee, strong farmers) • Increased commercial awareness • Women's role and participation in livestock management strengthened • Increased community cohesion	• Qualitative evaluation component • Leadership, cooperation, and cohesion games	• Communities assume full ownership of CBRLM in their GA • GAs have a strong leadership and are strengthened in decision-making • Communities organize themselves, combine their herd to access new levels of market • Intrusion of foreign livestock into GAs is reduced/regulated • CBRLM principles are spread to neighbouring, non-project areas	• Sustained GA Committee leadership • Qualitative assessment	• Local ownership: Communities apply CBRLM principles on their own, without any further external input • Communities are able to register collective land rights and to protect their GAs from grass poaching • Improved community-based decision making in response to local needs and ecological context
Overlap Community Development & Rangeland			• GA boundaries mapped • Digitized grazing plans produced, including fire management strategies			• Herder's social status improved • Herder turnover reduced			• Herder turnover rate • Herder payment • Proportion of herders owning livestock	
Rangeland Management		• Produce training materials on PGCH • Provide printouts of grazing plans • Provide GA-level training and support for PGCH	• Grazing plan charts kept updated	• Cattle is being herded, low stress handling • PGCH being followed as possible • Loss of animals reduced	• Loss of livestock • Extent of combined herding • Extent of planned grazing • Knowledge of basic rangeland management by all farmers • Knowledge of in-depth rangeland management by GALA trainees and community leaders	• Improved rangeland and soil condition • Perennial plants have time to recover • Synergies between livestock and rangeland actively fostered by communities • Fire management strategies applied • Occurrence of bush fires • Bush encroachment reduced • Land use potential maximized • Increased production per hectar			• Biomass • Soil cover • Variance of these indicators within a GA	• Environmental degradation on common grazing land in the NCAs is reversed, quantity and quality of rangeland fodder is improved. • Drought resilience is improved
Overlap Rangeland & Livestock				• Awareness about the synergy between cattle and rangeland created • Matching animal numbers to available forage with guidance from GOPA	• Herd restructuring completed	• Farmers de- and restock their herd autonomously according to climate conditions			• Number of cattle sold at the beginning of last dry season per household • Number of cattle bought at the beginning of last rainy season per household • Total cattle owned	

	Inputs	Activities	Outputs	Outcomes Short-term (less than one year after activity)	Means of verification	Outcomes Mid-term (until the end of the current program)	Means of verification	Outcomes Long-term (after the end of the current program)	Means of verification	Overall goals
Livestock Management		• Produce livestock-related training materials • Training in livestock management & husbandry • Determine herd composition • Determine herd production goal • Determine productive and unproductive animals • Herd restructuring • Bull scheme • Small stock pass-on scheme (SSPOS) • Provision of nutrition supplements • Encourage & implement improved kraal design	• Certificates provided • Livestock management & herd plans produced • Herd composition determined • Productive and unproductive animals identified • Bull scheme contracts signed and bulls delivered • Cow:bull ratio improved • Revolving fund established & small stock collected & delivered • Improved kraal design in place where possible	• Calving rates improved • Body Condition Score improved • Sale of non-productive animals • Better selection of animals for castration • Participation of women and herders through SSPOS • SSPOS: # of participating households increased • SSPOS: Herders turned into livestock owners • Improved knowledge and decision making on livestock management	• Bull:cow ratio • Calving rate • Cattle Body Condition Score • (Non-productive) animals sold during last year • Proportion of herders owning livestock • Knowledge of basic livestock management among farmers • In-depth knowledge of livestock management among GALA trainees and community leaders	• Average BCS is improved • Livestock health is improved • Herd productivity increased			•Bull:cow ratio •Calving rate •Cattle Body Condition Score	• Livestock in NCAs are healthier and more productive • NCA communities have improved understanding of animal husbandry, herd structuring, and animal health
						• Improved livestock practices applied (livestock management, husbandry, vaccination, supplemental feeding, etc.) • Improved animal health • SSPOS: Reduced herder turnover	• Cattle Body Condition • Number of calves weaned in past year • Access to bulls • Herder turnover	• Improved animal health		
Overlap Livestock & Marketing									• HH wealth • HH income • HH consumption	• HH income and livestock significantly improved. • Enhanced productivity and profitability of livestock farming
Marketing (Regional level)		• Tender and hire contractors for establishment/upgrade of auction facilities • Support & establish regional cooperatives • Training of cooperative staff and auctioneers • Organize auctions, conduct price analysis • Engage MAWF, MEATCO and other stakeholders • Establish a livestock byer's platform	• Regional cooperatives established & strengthened • More frequent and higher-quality auctions held • Regional marketing strategy established • Local/regional markets identified • (Regional) Livestock buyer's platform in place	• Commercial awareness of farmers raised • Cooperatives now have o Business plans o Implementation strategies o Initial capital o Operational staff and office • GA cattle owners participate in cattle auctions • Improved responsiveness to drought conditions	• Number of (productive/non-productive) cattle sold per household during last year • Household income through cattle sales during past year • Number of auctions participated in by household during last year • Number of GA cattle sold at auctions	• Increased commercial orientation, planning and gain o Cattle off-take rate increases o Farmers have realistic price expectations • De- and re-stocking applied • Offtake responsive to drought conditions			• Cattle off-take rate • Responsive to drought • Qualitative analysis of cooperatives nad auctions	• Cattle off-take rate in the NCAs is significantly increased • Livestock farming industry in the NCAs established
						• Regional cooperatives are self-sustained (generate income through auctioneering)	• Income for each regional cooperative through auctions during last year	• Regional cooperatives convert into a fully operational organization like Agra) • Increased access to markets		
Water	5 mil. US $	• Establish water point committees • Identify water infrastructure needs • Tender and contract water infrastructure specialists • Training in maintenance of water infrastructure	• Water infrastructure upgrades undertaken to enable PGCH: • Infrastrucure repaired • New boreholes and installations provided • Pipeline extensions • Earth dam development	• Water infrastructure enables PGCH	• Number of GAs with fully functional water supply for PGCH	• Communities are able to maintain their water infrastructure		• Water installation for PGCH in CBRLM GAs is being well-maintained. • Additional investment in water infrastructure for PGCH-type activities		• Have adequate water infrastructure in place in the NCAs to enable sustainable rangeland and livestock management
Capacity building		• Training material development • Staff training, Training of Trainers • Certification of field staff • Coordinate and cooperation with MAWF-DEES at management and field level • Development of a sustainability plan for handover of the project to MAWF-DEES	• CBRLM and DEES staff trained (see GOPA's Year 3 Report, p. 28, for a detailed list of components) • Staff prepared for project activities • Training and refresher workshops held • Field staff certified • Sustainability plan produced	• Well-qualified local staff • Staff motivation increased/maintained • DEES personnel included in CBRLM		• National, regional and local capacity and expertise built which can carry on with CBRLM.	• Qualitative analysis of relationship between government and project	• Local, trained staff pass along knowledge to other local implementers of PGCH-type activities in NCAs.	• Qualitative analysis	• CBRLM is taken over and continued by MAWF-DEES or other invested stakeholder(s).

Appendix B: Summary of Poll Results re: Timing of Endline

Timing of Endline Data Collection
Summary of Survey Response
November 11, 2013

IPA recently received feedback from eleven experts on appropriate timing for endline data collection. A detailed look at the survey results and justifications are in an excel file that accompanies this document.

The key tension in almost all responses was:

(1) Drought, slow program roll-out, and the naturally slow development of many key outcome measures may make it difficult to detect impacts by 2014.

(2) Program impacts may have started to deteriorate by 2015 absent external support.

The survey revealed two general trends:

(1) Behavioural outcome measures are considered achievable by 2014, while there is less of a consensus around the exposure period for other (non-behavioural) outcome measures.

(2) With regards to the other (non-behavioural) outcome measures:

(A) GOPA staff tended to prefer 2014 due to fears or program impacts starting to deteriorate by 2015 absent external support.

(B) External experts tended to prefer 2015 due to fears of drought, slow roll-out, and the naturally slow development of many measures making it difficult to detect impacts by 2014.