

DISSERTATION

SOCIAL OUTCOMES OF COMMUNITY-BASED RANGELAND MANAGEMENT
IN POST-SOCIALIST MONGOLIA: INFLUENTIAL FACTORS AND FAVORABLE INSTITUTIONAL DESIGNS

Submitted by

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ABSTRACT

SOCIAL OUTCOMES OF COMMUNITY-BASED RANGELAND MANAGEMENT IN POST-SOCIALIST MONGOLIA: INFLUENTIAL FACTORS AND FAVORABLE INSTITUTIONAL DESIGNS

Community-based rangeland management (CBRM) has been proposed as a promising option to reduce rural poverty and resource degradation in post-socialist Mongolia. To date, research on CBRM in Mongolia has been limited to small samples and case studies within one or two ecological zones. Results have been mixed, with some studies showing favorable outcomes and others no effect or negative impacts of CBRM. Few studies have directly compared the outcomes of formally organized CBRM with management by traditional herder neighborhood groupings, or attempted to identify the causal mechanisms that explain variations in CBRM outcomes. Using data from 142 pastoral groups and 706 member households across 36 counties (soum) in four ecological zones, I assessed social outcomes of CBRM organizations in comparison with non-CBRM groups, explored causal mechanisms underlying these social outcomes, and examined the effects of external facilitation on institutional design of formal CBRM organizations.

I found that formal groups had more information sources, stronger leadership, greater knowledge exchange, cooperation and more rules. Members of formal groups were more proactive in addressing resource management issues and used more rangeland practices than traditional neighborhoods. However, the two types of groups did not differ on most livelihood measures and had a weak difference in social capital. Four factors, access to diverse information sources, leadership, knowledge exchange and resource management rules, significantly facilitated the effect of formal organization on pastoralists' traditional and innovative rangeland practices, proactive behavior and social networks. Importantly, information diversity had a triggering effect on other three mediating

variables creating a sequential chain of information diversity → leadership → knowledge exchange → rules. This ordered chain of four mediators explains the mechanisms through which formal organization leads to comparatively greater social outcomes. I also found that these mediated effects on members' proactive behavior and social networking varied among ecological zones.

Donor facilitation approach significantly influenced CBRM group attributes and external environments, but did not affect institutional arrangements. Small group size, homogeneous interests, and heterogeneity of well-being predicted higher levels of intermediate outcomes including information diversity, leadership, and income diversity. Institutional arrangements such as the presence of sanctions, group-devised rules, frequent meetings, and recording documents increased cooperation, rules and information diversity. Similarly, access to training and local government support provided a favorable external environment for achieving intermediate outcomes. Regarding ultimate social outcomes, group characteristics such as dependence on livestock, homogeneity of interests and leader legitimacy were critical for increasing social capital, livelihoods, rangeland practices, and proactive behavior. Frequent meetings of group leaders had the greatest influence on ultimate social outcomes. Local government support and ongoing donor support were associated with increased trust and norms of reciprocity, rangeland management practices, proactiveness, and per capita livestock holdings. Overall, group attributes and external environment had a greater influence on social outcomes of pastoral CBRMs in Mongolia than institutional arrangements.

I found strong evidence that formal CBRM is leading to increased social outcomes across Mongolia. Many CBRM facilitation strategies were shown to be adequate for fostering social outcomes of the pastoral groups. Early achievements of individual household level variables such as rangeland practices and behavior appeared to be “fast” variables that respond quickly to new institutions. In contrast, building social capital and reaching livelihood improvement may be “slow” variables that require time and larger scale changes.

Globally, the promising case of CBRM in Mongolia may encourage mobile pastoral communities elsewhere to cooperate on the sustainable management of their resources. However, as this study showed, careful facilitation is needed to achieve intermediate outcomes, and consideration of the distinct dynamics of local resource systems is a necessary prerequisite for achieving increased social outcomes.

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AUTOBIOGRAPHY

Tungalag Ulambayar (Tungaa) grew up in the Southern Mongolia raised by her grandparents, who were Gobi nomadic herders. Tungaa received her undergraduate degree in philology from the Moscow State University after Lomonosov. Tungaa's MA degree in international development was from the International University of Japan. Tungaa has over 20 years of work experience in rural development and environmental conservation. She was one of the first participatory facilitators of community forestry and rangeland management programs in Mongolia. As a practitioner of community-based natural resource management, Tungaa conducted numerous participatory analyses with pastoral groups throughout Mongolia and helped them to organize for sustainable management of resources while maintaining livelihoods. Before joining the Colorado State University, she worked as a Team Leader for Environment and Disaster Risk Reduction at the United Nations Development Programme Office in Mongolia. This study involved two projects where Tungaa worked for the institutional development of the two types of pastoral groups: nukhurluls and herder groups. She addressed potential biases and subjectivity in her analyses by taking the realist ontology stance and approaching study subjects (in her case pastoral groups) from a perspective of a positivist social scientist. This research orientation pursues objective measurements of social reality combined with the deductive logic that uses precise quantitative surveys and statistics. An important focus of such positivist approach to research is to be value free without inferences from other subjective biases.

DEDICATION

*To my family: my husband Gansukh, and my girls, Saruul and Dulguun,
the source of my inspiration and love*

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1.1. Introduction

1.1.1. Background of the study.

Since the late 1990s, post-socialist Mongolia has been facing two major rural development problems: poverty and resource degradation. Various assessments have reported over one-third of the population living below the national poverty line (NSO and World Bank, 2001; World Bank, 1996). Recent studies also documented declines in conditions of natural resources including rangelands (Addison et al., 2012; Liu et al., 2013; Sankey et al., 2009). Issues have been further exacerbated by recorded changes in climate, particularly, warming temperature and increasing frequency and intensity of climatic hazards such as dzud and drought (Batima, 2006; Dagvadorj et al., 2010) and experienced by herders (Bruegger et al., 2014; Marin, 2010). These problems increase the vulnerability of Mongolia's livestock sector by threatening the sustainability of ecosystem services and human well-being (MEA, 2005a).

Today the livestock sector accounts for 14% of Mongolia's Gross Domestic Product, and 28% of the workforce is directly dependent on this sector (Ganibal, 2015). Rangelands comprising about 83% of country's territory provide a natural basis for the livestock sector and rural inhabitants, over 80% of whom are pastoralists (World Bank, 2009). Furthermore, Mongolia's pastoral systems have global significance, providing unique biodiversity and cultural landscapes. In preserving this natural and cultural heritage, scientifically-informed policy solutions are necessary.

This dissertation contributes to this important task by examining social outcomes of community-based rangeland management (CBRM) in Mongolia, which has been promoted as a promising option to address the challenges of poverty and resource degradation. The results of this research suggest practical guidance for designing CBRM institutions and strategies to achieve desired social outcomes

from CBRM in Mongolia, and add to global scientific and policy debates around the effectiveness of CBRM in addressing problems of common pool resources. This study addresses a major research gap by investigating causal relationships among factors influencing CBRM outcomes and testing the applicability of institutional design principles proposed by common pool resource governance theorists in the Mongolian pastoral context. To do this, I used a large sample of 142 pastoral groups distributed across four ecological zones, coupled with surveys of 706 member households. This unusually large and geographically extensive sample provides for a statistically powerful design with broad validity and generalizability under a range of Mongolian conditions.

1.1.2. Theoretical framework.

The theoretical framework of this CBNRM study is grounded in the new institutional theory (North, 1990) focusing on small-scale common pool resource (CPR) regimes (Ostrom, 1990), the theory of design principles for robust common property institutions (Agrawal, 2002), and complex adaptive systems theory (Gunderson & Holling, 2002). Mirroring the complexity of CBNRM, which requires multiple perspectives and interdisciplinary approaches (Armitage, 2005), my theoretical framework comprises diverse contributing concepts. Details of the theoretical foundation of the study are provided in the subsequent literature review section. Here I summarize the main elements of the conceptual framework as a basis for forthcoming research questions.

Within the new institutional framework, I consider CBNRM a management regime encompassing institutional, property rights and CPR aspects. Commonly accepted definition of CPRs emphasizes two attributes of these resources: difficulty of excluding potential users while each additional user's withdrawal reduces resource amount available to others. Various types of users may possess property rights over CPRs including private individuals or corporates, state and local community people. CBNRM requires resource users holding communal property rights over a CPR to constrain their

resource use and access by committing to collectively agreed rules. Theoretically, such common property institution should overcome the problems of resource overuse and practices and behaviors harmful to resource condition. Smaller (less spatially extensive) resources and resource user groups reduce transaction costs for rule enforcement through trust, shared norms and reciprocity.

The design principles for robust commons institutions predict favorable outcomes of CBNRM under certain conditions in four different aspects of CBNRM. These include characteristics of a CPR under CBNRM, attributes of a CBNRM group, internal governance arrangements among group members and external context to the CBNRM institution (Agrawal, 2002; Ostrom, 1990). More successful outcomes can be expected if (1) the resource system has clear boundaries, is stationary and of manageable small size, and resource units can be stored; (2) resource users reside in the same geographic location, share common norms over CPR practices, build social capital living together longer and frequently interacting, have strong leaders, and can exclude other potential beneficiaries; (3) rule change originates from resource users, is devised and enforced by them so that the rules are easy to understand, and has gradually increasing severity of punishments; and (4) national government legally recognizes the autonomy of CBNRM, and backs up their rule enforcement, external support for local capacity building is available, and market forces and technology are not hindering local resource economy.

The theory of complex adaptive systems (CAS) and its recent application to natural resource systems, have established that pastoral social-ecological systems exhibit CAS characteristics of non-linearity, uncertainty, emergence, scale and self-organization, and these characteristics are recognized among policy makers and the international development community (Berkes, 2004). This study considers essentials of pastoral social-ecological systems while placing it within the CPR field. Although theories of institutions, property rights, and design principles are largely applicable for pastoral commons institutions, empirical studies have repeatedly showed several mismatches. Research

(Fernandez-Gimenez, 2002; Turner, 2011) pointed out, in pastoral systems, mobility and flexibility need to be prioritized over exclusivity of resource access, social boundaries of users, and property rights to harmonize with unpredictable and variable environments of drylands.

In this study, on the basis of the theoretical framework elaborated, I advance the following research questions:

1. Does community-based rangeland management (CBRM) increase ultimate social outcomes of pastoral groups in Mongolia measured as livelihood, social capital, and rangeland management practices?
2. Can formal organization and intermediate social outcomes, including access to information, knowledge exchange, leadership, cooperation, income diversity, and the presence of rules, predict ultimate social outcomes of CBRM, accounting for differences among ecological zones?
3. How and why do social outcomes of CBRM groups differ from those of traditional non-CBRM groups in similar social, political and environmental contexts?
4. How does the ecological zone of pastoral groups influence relationships between formal organization, intermediate outcomes and ultimate social outcomes?
5. Are access to information, knowledge exchange, leadership, and the presence of rules causally associated, and if so, is there any causally-associated order?
6. Does donor facilitation approach influence the institutional design of CBRM in Mongolia?
7. Which institutional design elements are most influential in achieving greater social outcomes of Mongolian CBRM groups?

I define *social outcomes* as any positive status in the social well-being, environmental behavior, or collective action of group members including resource management practices, constructive behavior, improved social capital, and livelihoods. I categorized social outcomes of pastoral groups into two types:

intermediate and *ultimate* social outcomes. I hypothesize that intermediate social outcomes are enhanced by donor support and facilitate ultimate social outcomes. Hence, I consider intermediate outcomes as an *output* of CBRM. Ultimate social outcomes are a product of both formal organization and intermediate social outcomes. Thus, they are *outcomes* of CBRM. I assumed increased social outcomes are an integral part of long-enduring commons institutions.

The study has the following limitations. First, the data reflect a point-in-time measurement. Hence, I am unable to make truly causal inferences, which would require before and after measurements of both “treatment” and “control” groups. Second, the study does not fully consider external contextual variables, which may have an important influence on social outcomes of CBRM groups. Finally, I did not include qualitative analysis, which may limit nuanced interpretation of the results of quantitative analyses.

1.1.3. Organization of the study.

This dissertation is presented in five chapters. Chapter 1 introduces the background of the study, statement of the problems, objectives of the study, theoretical framework, research questions, definition of CBRM social outcomes, assumptions and study limitations. It also presents a review of the literature, which is further subdivided into six topics. The review starts from the common property institutions theory moving to the concept of CBNRM, its evolution and results, and then narrows to pastoral commons institutions. The review further covers the issue of measuring CBNRM outcomes, description of pastoral institutions in Mongolia, and studies on Mongolian CBRM.

Chapter 2 compares social outcomes of CBRM groups with those of non-CBRM groups, addressing Research Question 1. The chapter demonstrates that CBRM groups have more social outcomes than non-CBRM groups. Chapter 3 reports the results of a causal analysis of factors that influence CBRM social outcomes. The chapter addresses Research question 2-5 above including (a)

causal relationships of formal organization and intermediate outcomes on ultimate social outcomes; (b) mediating effect of intermediate outcomes on the relationship between formal organization and ultimate social outcomes; and (c) moderating effect of ecological zone on the relationship of formal organization and ultimate social outcomes. Chapter 4 compares different CBRM institutional design models in Mongolia with respect to their social outcomes. It addresses Research questions 6 and 7, which explore the applicability of CPR institutional design principles in the Mongolian pastoral context by identifying influential institutional design elements and effective facilitation strategies for Mongolian CBRM. Chapter 5 synthesizes the findings of the entire study, discusses their theoretical, methodological and practical implications, and provides recommendations for future research and CBRM policy.

1.2. Review of the Literature

1.2.1. Introduction.

The overall goal of this literature review is to establish the theoretical foundation of my research, its relevance and contribution to the field. For this purpose, I walk the reader through several logical steps all connected to the concept of community-based natural resource management (CBNRM), the topic of my research. The literature review is comprised of seven sections starting from the broader concept of common pool resources down to the review of studies of community-based rangeland management in the Mongolian pastoral context by gradually narrowing themes essential in CBNRM research. Throughout these sections, I lay out my arguments for CBNRM being a potential solution to address current resource management problems with a strong theoretical substance.

In Section 1.2.2, I place CBNRM in its theoretical realm of common pool resources (CPR). While bringing in key conceptual definitions, I define two CPR characteristics that challenge science and practice: excludability and subtractability. I further narrow a specific space of CBNRM within small-scale CPRs and its mission to address a dilemma situation with the presence of appropriation and provision

problems. Next, I explain property right institutions, the means for solving the two problems. Here, I highlight important nuances of CBNRM, its dependence on CPR characteristics, resource users' attributes and external larger governance systems that ultimately favor or impede efforts for addressing appropriation and provision problems leading to mixed results of CBNRM.

Section 1.2.3 defines CBNRM and briefs on its theoretical evolution, subsequent influence on international development and mixed results reported. I give more details on positive and negative results, which inspired more research on conditions that favor or constrain overcoming appropriation and provision problems of CPR. Also, issues of the methodological nature in CBNRM studies were described. Further, I point out rather limited research in pastoral commons field.

In Section 1.2.4, I narrow the CBNRM field down to the pastoral system and describe specifics of its social-ecological systems while providing definitions of key terms. I inform fairly unsuccessful outcomes of community-based rangeland management (CBRM) internationally. Hence, I turn reader's attention on details of problems for adjusting CBRM practical implementation to the general theoretical framework of CPR and institutions.

In section 1.2.5, I elaborate on issues of measuring outcomes of CBNRM as many relate the problems of mixed results to research methods. The section describes not only challenges and limitations of current studies of CBNRM, but identifies existing research gaps including the lack of examination of causal relationships and existence of causal order among influential factors, and a need for larger-N studies, more powerful for generalization and theoretical validity.

Section 1.2.6 provides essential details of Mongolian pastoralism and situates it among global CPR arena and more narrowly within pastoral systems with its resource characteristics, culture of resource users, their social organizations, property rights and key strategies. Simultaneously, the section clarifies the uniqueness of Mongolian pastoralism with its historical past and recent experiences of socio-political transformations. I also connect this narrative with the emergence of CBRM in Mongolia

promoted as an alternative solution to rural poverty and resource degradation faced by transitional Mongolia.

The last section reviews the state of knowledge in the CBRM in Mongolia. I describe overall research scope, geographic coverage, variables examined, methods applied and key findings. I define not only strengths and contributions of these studies but their limitations and gaps for furthering CBRM research in Mongolia. I conclude that there is an apparent need for larger sample studies covering different geographic scope important for CBRM outcomes and examining causal relationships of factors influencing CBRM results and testing applicability of theoretical models in the Mongolian pastoral social-ecological systems.

Based on this literature review, I contend that my research has strong theoretical foundation and will make necessary contribution to the scientific field while addressing existing research gaps.

1.2.2. Community-Based Natural Resource Management (CBNRM) as an institutional option for addressing the dilemma of Common Pool Resources.

CBNRM evolved as a promising option to address the dilemma of common pool resources (CPR) more effectively than state or market-based solutions. The CPR dilemma occurs due to resource attributes that make it difficult to exclude potential users (*excludability*) while harvest by each user reduces the resources available to others (*subtractability*) (Berkes, 1996; Ostrom et al., 1994). In this context, the ability of resource users to communicate with each other and agree on rules to self-regulate resource use for their collective benefit determines the final outcomes. In the absence of communication and agreement among resource users, the resource system is in a “tragedy of commons” situation of overexploitation (Hardin, 1968). This occurs because group members prefer short-term personal gain over the long-term group welfare, a situation known as a “collective action problem” (Olson, 1965). This behavioral result has been called a *CPR dilemma* (Ostrom et al., 1994). In

contrast, when resource users possess the ability to communicate and negotiate rules, they can obtain continuous benefits from their resources while maintaining adequate livelihoods (Ostrom, 1990).

Ostrom (1990, p. 26) specified that such outcomes relate to small-scale CPRs within a locality shared by resource users “heavily dependent on the CPR for economic returns.” The number of CPR users in the setting is small enough to allow repeated interactions with one another and to learn who is trustworthy, and how their actions will affect the resource as well as each other. Small size and high dependence provide the key factors for resource users to communicate, negotiate and self-organize to solve common problems. In addition, their CPR should be renewable but scarce, and rational behaviors of users can substantially harm other users (ibid).

Within small-scale CPRs, not all situations are necessarily dilemmas. Dilemmas are present in two conditions (Ostrom et al., 1994). It is a dilemma when resource users perceive that their current management strategies produce suboptimal outcomes. Secondly, it is a dilemma if there exist other strategies that are more efficient than the current practices and are “institutionally feasible” (p.16). The efficiency implies that “total discounted benefits exceed total discounted costs” (p. 16) of applying new strategies and resource users have a strong consensus for changing their strategies. When resource users face a CPR dilemma, they need to address two types of problems: appropriation and provision problems. *Appropriation problems* relate to the resource flow or products of a resource system like water and fodder (Ostrom & Schlager, 1996). These problems may include rational behaviors harmful to others, unfair allocation of or access to resources due to a heterogeneous distribution of resources spatially and varying technology for resource harvesting (Ostrom, 1990). *Provision problems* focus on the resource stock or resource systems including grazing land, irrigation system or a bridge (Ostrom & Schlager, 1996). These problems concern activities negative to the productive capacity of the resources and *free riding* on other users’ investment (Olson, 1965) for provision and maintenance of a CPR (ibid). To address these two problems, resource users need to agree to rules that define (1) “how much, when,

where, and with what technology to withdraw resources and/or (2) how much and when to invest in supply or maintenance to the CPR stock” (Ostrom et al., 1994, p. 16). When resource users self-organize and agree on rules prohibiting or allowing certain activities under particular conditions, they create a *common property institution*. First, I need to clarify the term *institution*.

As North defined them, “any form of constraint that human beings devise to shape human interactions, and limit the set of choices of individuals, are institutions”(1990, p. 4). Institutions have formal and informal forms. According to North, *formal institutions* are construed in laws and devised by a society, while *informal institutions* have evolved over time as codes of conduct and behavioral norms. Formal institutions can be created rapidly as a result of socio-economic or political changes while informal institutions in the forms of customs, traditions, and shared norms are rather resistant to a deliberate change. A group of resource users aka agents of institutional change with new rules to address the CPR dilemma, form an *organization* (ibid). Organizations have common objectives, which can be achieved by enforcing those rules through various governance structures, skills, and learning (ibid.). From the dialectic perspectives, institutions provide opportunities with structured incentives and “organizations are created to take advantage of those opportunities, and, as the organizations evolve, they alter the institutions” (p. 7). In this manner, institutional changes occur incrementally, when individuals within an organization believe that they can do better with new, more efficient strategies or rules (North, 1990; Ostrom et al., 1994). Inherent elements of institutions that come together with rule setting include costs for protecting rights, monitoring rule enforcement and punishments for violations. However, Ostrom contended that in small-scale CPR settings, resource users who live in the same geographic location over a long period of time build shared norms and reciprocal relationships and know whom to trust. Presence of such social capital facilitates the emergence of institutional arrangements that reduce transaction costs for rule enforcement (Ostrom, 1990). An ultimate role of an institution is

to reduce uncertainties by providing a framework, which guides behaviors and interactions of individuals and organizations (North, 1990).

The second term *common property* specifies one of four broad types of property regimes over resources including private, state and common property and open access. These are named by who has the rights to own or access the resources except the latter, in which everyone has free access to the resources. Such open access is part of CPR problems leading to tragedy of commons due to the lack of “enforceable authority” (Ostrom & Schlager, 1996, p. 130) that specify users’ rights to and responsibilities for access, use or management of a resource. Such mechanisms present property right regimes that are the product of institutions or rules (Ostrom & Schlager, 1996). Hence, property right regimes link the human system with the natural system (Berkes, 1996). The presence of all property rights including private, state and communal types facilitates viable solutions to appropriation and provision problems (Feeny et al., 1990), but none of these regimes alone has been more efficient than others for addressing environmental issues when lacking strong rule enforcement (Berkes, 1996). For instance, when national governments fail to adequately enforce laws for natural resources, they create *de-facto* open access to resources resulting in overuse and conflicts (Ostrom & Schlager, 1996). In practice, different property regimes overlap in various combinations not necessarily in a “pure” form of above-stated types. Among all variations, common property resources present a distinct category because by nature, many such resources have exclusion and subtractability problems explained earlier.

The ways different property rights regimes form have been shaped by three major factors: (1) CPR attributes, (2) characteristics or cultures of resource users and (3) larger governance regimes (Ostrom & Schlager, 1996). (1) CPR physical attributes such as stationarity of the resource and possibility for storage, heterogeneity of resources across space substantially influence the property regimes (Blomquist et al., 1994). Further, they also affect the effectiveness of institutions to address appropriation and provision problems. For instance, if the resource is stationary (not mobile) it is less

costly to assess potential annual yields for allocation purposes. In addition, stationarity allows resource maintenance activities such as planting desirable species or dealing with weedy plants. Similarly, when a CPR can be stored, it reduces uncertainty and lessens competition for resource appropriation among users. Also resource users are more motivated to contribute to the resource maintenance. When CPRs are stationary and can be stored, information on resources and expected yields or flow of benefits can be obtained in a less costly manner for addressing appropriation and provision problems (ibid.). Lastly, if a CPR is heterogeneous spatially, resource users need to keep it in a larger unit to reduce their risks and costs (Ostrom & Schlager, 1996). (2) In terms of cultures of users, there are identified types of resource groups who are likely to be more effective in addressing CPR problems under their communal property. These include small and stable groups having relatively homogeneous preferences for resource use, shared norms of reciprocity and trust, low discount rate, and common understanding about potential benefits and risks from changing rules (Ostrom & Schlager, 1996). (3) Larger governance regimes such as national government substantially influence local property regimes (ibid). Ostrom et al (1996) highlighted potential positive roles they can play in the effectiveness of local property right institutions. These included definition of property rights for larger resource systems, provision of information about resource systems, enabling conditions for collective action and local decision-making and backing-up enforcement efforts.

Within property regimes there are five types of property rights including (1) access to the resource, (2) withdrawal of resource units, (3) management of resource system, (4) exclusion of potential beneficiaries, and (5) alienation of the resource (Ostrom & Schlager, 1996). First two types are operational level property rights, where participants simply exercise their rights. The other three were categorized as collective choice level rights, where participants are involved in deciding their future rights to be exercised (ibid). Apparently, collective choice rights are more powerful, with important economic and political incentives to local resource users.

CBNRM has been suggested as an alternative to address CPR problems because it has encompassed many of the features described above in terms of characteristics of resources and community of resource users. However, since CBNRM is embedded within larger governance systems, its success has been also subject to the support of such regimes. The phenomenon of conflicting CBNRM results has been called the *“drama of the commons”* (NRC, 2002), with either happy successful or sad failed endings. In the next section, I will elaborate on theorized factors affecting these mixed results in the context of CBNRM, along with its evolution, definition and core characteristics.

1.2.3. CBNRM: definition, evolution, outcomes and institutional designs.

The outline in the prior section allows us to define CBNRM and explain why it gives promising perspectives for CPR management. It is a small-scale management regime (McCay, 1996) by local resource users who have a CPR held as communal property with the goal of overcoming the CPR dilemma. As a management regime, CBNRM combines CPR under its management, a property institution and an organization of resource users. CBNRM has two well-recognized objectives: conserving resources and maintaining the livelihoods of resource users (Campbell & Vainio-Mattila, 2003). According to Armitage (2005), CBNRM promotes better resource management with the participation of local resource users in decision-making by combining traditional institutions, customary practices, and knowledge with formal regulatory and enforcement processes. From the property types perspective explained in the prior section, CBNRM aims to provide collective choice level rights to local resource users.

Conceptually, the evolution of CBNRM has been influenced by three paradigm shifts in ecological thinking: “(1) a systems view, (2) inclusion of humans in the ecosystem, and (3) management by participatory approaches,” (Berkes, 2004, p. 624). A move away from a reductionist linear approach to the systems view of the environment has had considerable management implications (ibid).

Characteristics of a complex resource system including non-linearity, uncertainty, emergence, scale, and self-organization (Gunderson & Holling, 2002), require equally complex social strategies instead of a rigid uniform system of a state administration. Such management approaches must be flexible, scale-sensitive, and adaptable to effectively respond to non-linearity and uncertainty of resources (Berkes et al., 2003). Secondly, the inclusion of humans in the ecosystem, referred to as a *social-ecological system* (Berkes et al., 1998), highlighted not only the effects of humans on nature and dynamic interactions between them, but human-devised institutions at different scales of the system. Lastly, recognition of the importance of place-specific qualitative information, which compliments broadly generalized quantitative data, has led to a participatory management approach (Berkes, 2004). Such participatory strategies involve various stakeholders including representatives of local government, resource users and higher level management agencies. Hence, the new approach acknowledges the significance of place-based traditional knowledge complimentary to the expert knowledge.

From these theoretical perspectives, CBNRM presents a promising approach for sustainable management of small-scale CPRs, which is flexible enough to deal with local resource complexity. The basis of this argument includes intimate knowledge of local users about their resources and locally evolved informal institutions in the forms of cultures and norms that, in turn, have been shaped by their environment. The theory also clarified CBNRM's institutional scale (Berkes, 2004) and its embeddedness in larger governance systems. Such positioning of CBNRM implies not only its dependence on the external systems but its influence on larger scales of resource governance as a part of a nested system (Ostrom & Schlager, 1996). Putting local resource users at the center of CPR management required nuanced communication with them, learning from them and sharing expert knowledge with them. This demand has been enabled through sets of participatory tools designed to address varying levels of educational and language barriers and cultural differences between "outsiders" and local community members (Chambers, 1997).

These theoretical approaches considerably influenced international development policies to undertake a major shift in their strategies. For development organizations, CBNRM has provided a plausible option to tackle both resource degradation and poverty problems, which used to be separate action fields (Armitage, 2005; Campbell & Vainio-Mattila, 2003). A broad recognition of local initiatives and their roles in sustainable development involving both conservation and livelihood objectives was first formalized in the Brundtland Commission Report released by the World Commission on Environment and Development in 1987 (Campbell & Vainio-Mattila, 2003; Dressler et al., 2010; Leach et al., 1999). This strong mandate for local participation in development agendas was further strengthened by subsequent global forums, has guided programs of national governments and funding priorities of donor agencies and international environmental organizations. Since then, CBNRM has become a popular development narrative in developing countries, particularly Africa (Blaikie, 2006) and South-east Asia (Leach et al., 1999), and more recently in post-socialist countries of the Central Asia (Crewett, 2015; Fernández-Giménez, 2012).

For the last three decades of “policy experiments” (Agrawal & Gibson, 2001) of CBNRM, it has produced mixed results, challenging both CBNRM practitioners and commons scholars. Through increased engagement of local communities, CBNRM promoted positive behaviors and practices in managing natural resources, better decision making and contribution to the improvement of ecological and economic well-being in local areas (Lyons, 2013; Measham & Lumbasi, 2013; Taylor, 2009; Thompson, 2013). However, studies also have reported unequal distribution of benefits among community members, or “elite capture” of gains and exclusion of disadvantaged community members (Balint & Mashinya, 2006; Cleaver, 2005; Duffy, 2006; Saito-Jensen et al., 2010; Suich, 2013a). Moreover, the challenges of decentralizing resource management and defining social boundaries for exclusive membership have hindered CBNRM efforts (Agrawal & Gibson, 1999; Agrawal & Ostrom, 1999; Blaikie, 2006; Dressler et al., 2010). Such controversy around CBNRM has attracted increasing scientific

attention to investigating the conditions under which it works or does not work (Agrawal, 2001; Berkes, 2004).

Persistent scientific efforts on the topic inspired by Ostrom (1990) have resulted in a “well-developed framework” (Agrawal, 2014, p. 89) of design principles for evolving CBNRM institutions and conditions for the institutional development process (Ostrom, 2008). In line with the prior empirical results outlined in section 1.2.2, the design framework consists of four major sets of variables that favor sustainable commons institutions. These include (1) resource system characteristics, (2) characteristics of resource user group, (3) institutional arrangements or rules, and (4) external environment (Agrawal, 2002; Baland & Platteau, 1996; Ostrom, 1990; Wade, 1988). Agrawal (2002, p. 62) analyzed prior studies on design variables within each set and created a comprehensive list to aim future research. Resource attributes such as relatively small size, well-defined boundaries, stationarity, possibilities for storage of resource benefits and predictability of resource flow were identified to be positive factors for institutional effectiveness. Correspondingly, resource user groups that are small, with clear membership boundaries and shared norms, having social capital built over time and leadership, homogenous identity and interests but heterogeneous skills and endowments, and low rates of poverty were shown to have better chance of achieving success. Among the institutional arrangement variables, rules that are simple enough to understand, devised by group members, easy to enforce and have graduated sanctions (punishment severity increases by steps), less costly adjudication and the monitors are accountable to resource users, were more likely to be effective. Lastly, advantageous external environments included less expensive exclusion technology, low rate of technological advancement for resource harvesting, less integration with external markets, central government acknowledging local authority, supportive external sanctioning institutions, adequate levels of external aid, and nested structure for appropriation, provision, enforcement and governance functions.

After analyzing 91 cases that tested the framework, Cox et al. (2010) found it to be a viable basis for future research. However, the framework has been criticized for being incomplete (Agrawal, 2001; Baland & Platteau, 1996; Schlager et al., 1994), rigid (Blaikie, 2006; Cleaver, 2000) and with too much focus on rules while not accounting for social complexity (Blaikie, 2006; Cleaver, 1999). The critics were also concerned about the possibility of the framework turning into “blueprints” for governance of commons institutions despite its nature of universal propositions or general features of successful commons management (Agrawal, 2002). In response, Ostrom highlighted the importance of “matching the rules of a system to the underlying biophysical world and type of human community involved” (2008, p. 16).

The institutional design framework has been used to assess the effectiveness of commons institutions managing a range of resource types in varying social-ecological settings. However, the interest in testing the tool for the pastoral institutions has been modest; only 7% of the 91 cases reviewed by Cox et al. was in the pastoral sector (2010, p. 7). In the following section, I will bring readers’ attention to CBNRM in the pastoral context with specifics of resources and strategies developed by pastoralists to respond these resource characteristics. I will also highlight issues of CBNRM implementation in the pastoral social-ecological systems.

This section elaborated on three major theories on which my conceptual framework was built. The new institutional theory, theory on institutional design principles and complex adaptive systems theory were major contributors to frame my research on CBRM development in Mongolia. Consequently, I shall frequently refer to these theories in my later chapters for analyzing social outcomes of pastoral institutions.

1.2.4. CBNRM and pastoralism.

In the last decade, community-based management of pastoral commons has had considerable attention of national governments and international assistance agencies but results have not been impressive (Turner, 2011). Reasons for such modest achievements have been thought to be associated not only with those factors discussed in the prior sections but with much broader socio-economic and political circumstances that affected pastoral development (Galvin et al., 2008; Niamir-Fuller & Turner, 1999; Turner, 2011). I will elaborate on specifics of pastoral social ecological systems including resources, humans and their interactions. This will lead to further discussions on mixed CBNRM outcomes in the pastoral context.

Pastoralism presents a socioeconomic system well adapted to dryland environments by means of developed sets of practices and knowledge for maintaining a sustainable balance among pastures, livestock and people (Agrawal, 1991; Koocheki & Gliessman, 2005; Niamir-Fuller & Turner, 1999; UNDP, 2003). Drylands, home to pastoralism, cover 41.3% of the global terrestrial area (MEA, 2005b, p. 23), where about 200 million pastoralists make their living (Koocheki & Gliessman, 2005). According to the Millennium Ecosystem Assessment (2005b, p. 7), about 90% of dryland populations live in developing countries with far lower human well-being indicators than the rest of the world. Drylands are characterized by water scarcity, a limiting factor for ecosystem provisioning services such as production of forage, crops, and wood (MEA, 2005b). In these regions, precipitation that is low and highly variable in space and time has challenged humans and animals over time, influencing their adaptive capacity. *Pastoralists*, who live in drylands, derive most of their livelihoods from grazing livestock that in turn are highly adapted to feeding on natural forage under extreme climatic conditions (Sandford, 1983). Lands that produce natural forage for grazing and browsing animals without human manipulation have been termed as *rangelands* (Holechek, 2011). Pastoralists' livelihoods depend on their intimate knowledge of local resources and the state of their livestock. Depending on climate, available species of forage, water,

geography of terrain and economic benefits, pastoralists herd different types of livestock including camels, horses, cattle/yaks, sheep, goats, reindeer, llamas and alpacas.

A defining feature of pastoralism is *mobility*, the key strategy for responding to ecological variability of drylands (Fernandez-Gimenez & Le Febre, 2006; Niamir-Fuller & Turner, 1999; Sandford, 1983). Pastoralists are classified as nomadic, transhumant, or sedentary, based on the type and degree of livestock mobility. *Nomadic* pastoralists have highly frequent mobility in irregular patterns, while *transhumant* herders move seasonally between fixed grazing areas (Niamir-Fuller & Turner, 1999). *Sedentary* pastoralists move less frequently, have permanent residence places and their livelihoods are dependent in certain degree on non-pastoral sources (Koocheki & Gliessman, 2005). Although pastoralists make productive use of rangelands with limited potential for economic benefits such as crop production, they have been marginalized socially and politically with negative stereotypes and myths (MEA, 2005b; UNDP, 2003). Persistent colonial views of pastoralism as backward, unproductive, and environmentally damaging dominantly shaped government policies and donor interventions till the mid-1990s (Galvin et al., 2008; Jun Li et al., 2007; Turner, 2011). Such policies included restriction of mobility, forced settlement of pastoralists, land titling, and destocking programs (ibid).

A new pastoral development paradigm under the influence of major shifts in ecological thinking discussed above fundamentally challenged these adverse portrayals of pastoralism and pastoral policies (ibid). Adaptive strategies of pastoralists including mobility, flexibility of decision-making, opportunistic stocking, diversification of livestock species, reserving key resources for hard times, splitting of herds and redistribution of assets were scientifically acknowledged as being most efficient and sustainable (Ellis & Swift, 1988; Scoones, 1994). Pastoral institutions encompassing these essential practices regulate resource use and conservation, minimize risks to people and livestock, avoid disease outbreaks, and promote collective actions for human safety and subsistence (Niamir-Fuller & Turner, 1999). Vital social elements of these customary institutions have been pastoral norms of reciprocity and mutual

trust, and ability to communicate with one another that all contribute to strong social capital among pastoralists (ibid). However, pastoral strategies have been blamed for social and political instability and marginalization of pastoralists for political participation, social service delivery and development investments (UNDP, 2003). Nowadays, pastoralists face many constraints including vulnerability to climate change, water scarcity, increasing sedentarization, poor access to markets, growing population pressure and insecure land tenure and land fragmentation (Galvin et al., 2008; Niamir-Fuller & Turner, 1999; UNDP, 2003).

Having clarified specifics of pastoral social-ecological systems, I can now turn to the results of community-based rangeland management (CBRM) in drylands. Studies have concluded that communal property regimes are better suited to variable, unpredictable and low rate of resource flow in pastoral regions, which allows mobility (Niamir-Fuller & Turner, 1999). State management or privatization of grazing lands have often failed, leading to increased resource degradation, human poverty and marginalization of pastoralists (Galvin, 2009; Hobbs et al., 2008; Jun Li et al., 2007). These experiences demonstrated the viability of customary institutions that communally manage grazing lands. However, as a result of decades of social and political assaults with a loss of their pastures and cultural identity, traditional institutions have been much weakened or disintegrated in many pastoral regions. From these perspectives, CBRM has provided a means to revive pastoral institutions by strengthening inherent elements of pastoral culture and reclaiming their access to resources and acquiring formal recognition. Nonetheless, as noted earlier, empirical studies have shown a substantial disconnect between theories and on-the-ground practices of CBRM.

Turner (2011) argued that there were several factors leading to the ineffectiveness of CBRM for improving resource condition and pastoral livelihoods. These included perpetual negative views of pastoralists among policy-makers, development officials and experts, recent political socioeconomic changes in many dryland regions, and increasing integration of pastoral communities into the systems of

education, regulatory policies, and market economies originated from the West (ibid). These contextual dynamics all undermined in some extent the development of CBRM, but there were more specific conceptual issues as highlighted by Turner. Essentially, he pointed out “vagueness surrounding the concepts of livestock mobility and common pastures, and contradictions between the institutional requirements of these two conceptualizations” (p. 475) due to dryland resource characteristics. First, many CBRM programs suffered from “abstract understanding” of livestock mobility without considering its complexity that involves “labor availability, access to markets, the knowledge and social networking of herders, (in)security in rural areas through which livestock moves, and access to the paths, pastures, and water sources needed to reach destination pastures” (p. 477). Hence, those programs often fail to facilitate the institutional capacity to support these necessary preconditions for the mobility and regulate “spatiotemporal distribution of livestock grazing” (p. 476) at larger scales.

Second, Turner underlined the contradictory nature of two goals prioritized by CBRM efforts: (1) reducing transactions costs related to the mobility, and (2) overcoming provision problems of overstocking common pastures. Paradoxically, under conditions of drylands, the former goal would require flexible non-exclusive management approach, while achieving the latter needs delineated boundaries of resources and users holding access rights with clear exclusion. Using a Sahelian case of West Africa, Turner demonstrated that prioritization among the two goals can be very context-specific but management policies in drylands should emphasize addressing uncertainty and avoiding procedures constraining livestock mobility. The lack of understanding of this important contradiction has led to negative results such as resource degradation and conflicts, which have been viewed as problems of community based management. As it was mentioned earlier, failures of exclusionary measures in the pastoral systems shown in other studies (Fernandez-Gimenez, 2002; Jun Li et al., 2007; Quinn et al., 2007) have been in line with the arguments of Turner. Hence, it is apparent that a demand for a modification of commons theory proposing conditions appropriate for pastoral social-ecological systems

is emerging. Such sub-theory would remove the existing confusion over limitations of the general commons theory for fitting dryland conditions and associated policy failures. Apart from these issues of disjuncture between theories and practices, many have raised concerns of methodological flaws for measuring outcomes of community based management, which in turn contributed to the varying results reported (Agrawal, 2002; Shackleton et al., 2010). In the following section, I will review literature on issues of measuring CBNRM results with a focus on social outcomes.

1.2.5. Measuring outcomes of CBNRM.

Scientific assessment of CBNRM outcomes has been a challenging task due the complexity of the social-ecological systems it involves (Agrawal, 2002; Agrawal, 2003; Plummer & Armitage, 2007). Starting from the definition of success for CBNRM that can be commonly accepted, measuring its outcomes has faced multiple complications. For instance, assessment of environmental outcomes encounters many confounding variables; variability among case studies limits comparison and generalization (Agrawal, 2002), and often ecological results are slow to appear (Koontz & Thomas, 2007). Similarly, evaluation of social outcomes has difficulties for measuring abstract concepts such as trust and values, defining appropriate scale for determining social outcomes, and examining processes and causal relationships between CBNRM, environmental and social outcomes (Agrawal, 2003; Agrawal & Chhatre, 2006; Lyons, 2013). In addition, there has been a less emphasis on comparative studies of outcomes of CBNRM with non-CBNRM approaches, as well as few large-N studies with greater potentials for generalization and validity (Agrawal, 2002).

CBNRM encompasses a multiplicity of perspectives and diversity of ecosystems and institutions that require an interdisciplinary approach to evaluate its outcomes (Gruber, 2010; Plummer & Armitage, 2007) involving resource users and stakeholders (Mulrennan et al., 2012; Sultana & Abeyasekera, 2008). Nonetheless, most assessment efforts have objectives to examine CBNRM performance for achieving its

two major goals: improving resource condition and well-being of resource users. From the CPR perspective, assessments investigate to what extent CBNRM is successful in addressing appropriation and provision problems. From social-ecological systems thinking, CBNRM evaluation explores adaptive capacity of CBNRM institutions, its ability to learn and self-organize and foster innovative solutions to external shocks while maintaining its inherent system features (Armitage, 2005; Gooch & Warburton, 2009). Within the institutional framework, studies analyze which CBNRM design principles work better for different CPR types, socio-cultural groups, internal governance arrangements and external economic and political contexts (Agrawal, 2002). Our review concerns social outcomes of CBNRM, roles of resource users and their institutions, the core of all three perspectives mentioned above.

Empirical studies assessing social outcomes of resource user groups commonly use different sets of variables: livelihood measures (Suich, 2013b), social capital including trust and norms of reciprocity (Wagner & Fernandez-Gimenez, 2008), social networks (Lauber et al., 2008), cooperation, and interests, conflicts, power relations (Zulu, 2008) and practices of individual members (Thompson, 2013). Institutional evaluation of CBNRM social outcomes applies not only these attributes of the user groups but internal arrangements such as rule-setting and modification, rule types, enforcement mechanisms, leadership, legitimacy, equity (Kellert et al., 2000), participation (Constantino et al., 2012) and external economic and political systems, to which CBNRM is embedded (Ogbaharya & Teclé, 2010). Following Ostrom's design principles (Ostrom, 1990, 2008) many studies appraised institutional designs in terms of their effectiveness and sustainability of CBNRM outcomes (Brooks et al., 2012; Cox et al., 2010; Crewett, 2015; Quinn et al., 2007). Research also links these variables at user group and institutional levels with ecological conditions and CPR issues that substantially influence CBNRM outcomes (Agrawal & Chhatre, 2006).

Although a body of literature has studied these factors for CBNRM performance and social outcomes, there has been little attention to causal relationships between these variables (Agrawal,

2002) in terms of their output-versus-outcome link. For instance, variables such as increased cash income, household assets, livestock holdings and favorable practices to resources can be clearly considered as outcome variables. While other factors including information, communication, leadership, and available assistance lack such intuitive outcome quality. Rather, they are more likely to be output-type variables that contribute to achieving outcome variables. In addition, researchers also pointed to the dynamic process-oriented and interrelated nature of the variables influencing CBNRM outcomes (Agrawal & Chhatre, 2011; NRC, 2002). In this respect, outcome-type variables created by output-type factors can require higher levels of output for further strengthening of CBNRM institutions. For example, increased social capital through frequent interaction, communication, cooperation, and leadership can foster more collective action and innovation among members that would in turn demand greater information, leadership and social networking. Another gap highlighted by researchers (Agrawal, 2002; Poteete & Ostrom, 2008) was a need for large-N studies that could complement qualitative case studies and expand potential for representativeness and generalization.

The prior four sections clarified connections of CBNRM with CPR theories and its potential for addressing CPR dilemmas. I also placed CBNRM among other property rights institutions with its strengths, weaknesses and dependence on larger governance systems. I explained specifics of CBNRM in the pastoral context with management implications while emphasizing a need for more studies examining CBRM institutions. Problems of the disconnect between theories and practices of CBRM, the lack of understanding of existing contradictions of CPR theories among those facilitating CBRM and its negative consequences on resource condition and well-being of resource users were elaborated in an effort to explain reasons for the ineffectiveness of community-based rangeland programs. The last section illustrated the complexity of measuring outcomes of CBNRM and existing gaps in studying causal relationships among variables influencing CBRM results and vagueness of output-outcome links among them. These measurement issues have been viewed as part of problems negatively influencing CBNRM

reputation. In the following section, I will discuss the context of Mongolian pastoral institutions, their place among global CPR community sharing similarities as well as their uniqueness in terms of the ecological and social-political background. The section will also review how rural development problems resulted from broader social reforms triggered the emergence of CBRM institutions in Mongolia.

1.2.6. Mongolian pastoral institutions.

Pastoral institutions in Mongolian rangelands have been shaped by its resource characteristics under the influence of country's geography and climate. According to the classification of Millennium Ecosystem Assessment (2005b), Mongolia's climate falls into arid and semi-arid categories of drylands. Mongolia's geographic location at the center of Asian continent remote from oceans at the elevations ranging between 800-1500 m exposes the country to the winds of the southern desert (Douglas et al., 2006). Additionally, mountain systems in the western and northwestern Mongolia capture atmospheric currents containing moisture from the Atlantic Ocean (ibid). The dry continental climate of Mongolia is characterized by long cold winters and short warm summers, low precipitation and high fluctuation of temperatures spatially and temporally (Batima, 2006). Mean annual temperatures and precipitation increase from the south to the north of the country by three major ecological zones: in the desert steppe, these are 4.5°C and 75 mm; in the steppe, 1.5°C and 200 mm; in the mountain steppe, -2.5°C and 270 mm (Dagvadorj et al., 2010). The coldest month is January with average temperatures ranging between -15°C and -35°C. July is the warmest month with the mean temperature reaching 25°C. The absolute temperature fluctuations recorded were -56°C in 1972 and 44°C in 1999 (Batima, 2006). In terms of precipitation, 70-90% of annual precipitation occurs in summer and the aridity gradient follows altitudinal gradient with a gradual shift from humid alpine zone via semi-arid mountain steppe to arid lowlands of the southern desert zone (Zemmrach et al., 2010). As Batima (2006) noted precipitation intensity can be as high as 40-65 mm in a single hour. According to these patterns of temperature and

precipitation, vegetation production and species diversity vary across ecological zones, where annual standing crop (dry weight) has higher yields in the mountain forest (1,150-1,940 kg/ha) and steppe (650-1,300 kg/ha) regions (Douglas et al., 2006). In the desert steppe, standing crop yield ranges between 290-380 kg/ha but with diverse vegetation communities (ibid). In the condition of such highly variable and low resource production, forage availability for livestock has been the determining factor for rangeland management regimes in Mongolia (Okayasu et al., 2011).

Through centuries-long adaptive processes in the dryland conditions described above, Mongolian pastoralism has developed efficient institutions for managing rangeland resources. However, in the last century, Mongolia has gone through substantial social transformations challenging pastoral social-ecological systems. These changes considerably influenced pastoral institutions and property regimes that ultimately led to the development of CBRM in Mongolia. Hence, it is essential to explain the ways these reforms affected Mongolian pastoralism and the emergence of CBRM.

Fernandez-Gimenez (1999b) considered three major periods that historically shaped contemporary pastoralism in Mongolia. These included (1) pre-communist period before 1924, (2) socialist collective era from 1960 to 1990, and (3) post-socialist time since livestock privatization in 1993 (p. 319). I will briefly summarize major changes occurred in each period with corresponding implications for the pastoral social-ecological systems while describing dominant institutions, social organizations and rangeland practices.

In the first period, the Manchu colonial rule divided Mongolia into smaller administrative units, which restricted herders' movement outside of their native principality (Bold, 2001). According to Bold (pp. 45-47), pasture lands were divided into several use types by different appropriators: (1) for the personal use of the Manchu emperor for his herds and hunting; (2) for the state use such as the relay post services (Mong. *urtuu*), border protection (Mong. *kharuul*) and the army and military households (Mong. *tsergiin khuree*); (3) for the use of the religious head of Mongolia and other Buddhist dignitaries

(Mong. *otog*); (4) hereditary use by noble princes; and (5) use by common herders. This typology meant the existence of certain degree of exclusion and the hierarchy for accessing the best grazing areas. Despite the legally prescribed rights, common herders had constraints to truly exercise their rights including the lack of transportation and labor (ibid). In addition, Bold argued that in the nomadic economy, ownership of land was inferior to the ownership of livestock as a means of production. Hence, property regimes included access, withdrawal, management and exclusion without alienation.

Institutionally, both formal and informal types coexisted for allocation of grazing areas and regulation of seasonal movements and pasture use (Fernandez-Gimenez, 2002; Upton, 2005). Major social organizations of herders included *khot ail*, *bag*, *khoshuu* and *aimag*. *Khot ail* was the smallest unit including 2-12 households under acknowledged leadership of an experienced or wealthier member. Families in *khot ail* camped, travelled together sharing their labor, cooperated on labor-intensive tasks such as seasonal migrations. In this manner, *khot ail* functioned as a social safety net reducing risks where poor members benefited from subsistence help of wealthier ones in exchange for their labor (Fernandez-Gimenez, 1999b; Simukov, 1934). Membership in *khot ail* was flexible and varied seasonally or yearly (ibid). Other types of social organizations reflected more of formal administrative divisions. *Bag* consisted of 50-100 households, who resided in the same geographic location sharing common pastures and resources. Within *bag*, there were informal social groupings of neighborhoods called *nutgiinkhan* (people of the same area or valley) consisting of several adjacent *khot ails*, who shared common norms for resource use and cooperated on larger scale rangeland management activities (Mearns, 1996a). These included coordination of pasture use, hay areas, water sources, salt licks, search of lost animals, fire wood collection and long-distance movements (ibid). *Aimag* was administratively largest unit with its territories stretching horizontally from the south to the north crossing all ecological zones, which allowed seasonal movements of livestock. With the imposed division by the Manchu into smaller *khoshuus*, mobility was restricted within *khoshuu* boundaries (Bold, 2001).

The second period started with the victory of struggles of Mongolians for independence since the early 20th century. Subsequent reforms turned Mongolia into a socialist system under the strong influence of newly created communist Russia (Baabar, 1999). During the socialist period, land and livestock were nationalized and herders became employees of state livestock collectives (Mong. *negdel*). These collectives existed over 30 years and coordinated pastures and seasonal migrations taking care of transportation, water availability, social and veterinary services and necessary labor (Academy of Science, 1990). During the collective years, major traditional pastoral practices were maintained and strengthened by education, social services and technology improvement (Swift, 1995). In 1931, the socialist government further divided the country into 18 provinces and 320 soums (counties) and cooperatives for the purpose of the economic development (Bruun & Odgaard, 1996). Hence, the scope of livestock mobility was further curtailed (Galvin et al., 2008). State collectives created a new generation of herders who were totally dependent on the state support for not only rangeland management activities such as transportation and labor for migration, supply of fodder, water and camp facilities, and marketing livestock products but also other services of social welfare, education and health (Bruun, 2006).

The third period commenced with an adoption of Mongolia's new Constitution in 1992, which officially declared the country's shift to a democratic system of government and free market economy. Hence, privatization of state-owned industries occurred rapidly, including state livestock collectives (Mearns, 1996a). Privatization of livestock attracted many laid-off state factory workers from urban settlements back to their home areas. This influx of inexperienced herders sharply increased the herder population reaching 43% of country's population in the early 1990s (Mearns, 1996a; NSO and World Bank, 2001). With decollectivization, formal institutions for rangeland management became nearly absent leaving pastures under much weakened informal institutions (Fernandez-Gimenez, 2002; Mearns, 2004). Some argued that the absence of formal regulation turned pastures into *de-facto* open

access (Upton, 2008). Herder households were left without social and veterinary services, transportation, labor assistance and rural infrastructure maintenance once livestock became their own (Fernandez-Gimenez, 1999a; Mearns, 1996b). In addition, inexperienced in marketing their products under the new economic system, many herders were exploited by urban traders with sharply decreased terms of trade (Fernandez-Gimenez, 2002; Rossabi, 2005).

Without the support from collectives, many now private herders lacked access to transportation and additional labor that restricted their seasonal movements (Fernandez-Gimenez, 1999b, 2001). Along with decreased mobility, “new” herders increased a demand for pastures placing further grazing pressures. These dynamics led to negative changes in rangeland practices and behaviors such as increased out-of season grazing, year around use of key resource and trespassing of reserved pastures by others (Fernandez-Gimenez, 2001; Upton, 2008). Such adverse trends implied overall retreat from traditional cooperation with others, adherence to customary norms for resource use, and a rise of conflicts and mistrust and a move to more opportunistic strategies (Upton, 2005, 2008; Fernandez-Gimenez, 2002). It is likely that these patterns in resource management contributed to the perceived degradation of rangeland resources and increase of rural poverty by the mid-1990s (Mearns, 1996b; Swift, 1995). A poverty assessment conducted in 1996 reported that 80% of the rural poor were herders, of which a half was “small herders” having less than 15 animals ¹(World Bank, 1996). Further, these studies informed about increasing inequality among the herders, emergence of informal labor market in the livestock production and herders’ acute needs for education, health and communication services highlighting their “information hunger” (NSO and World Bank, p. xii). These issues have been further exacerbated by ongoing climate change documented by scientists (Angerer et al., 2008; Dagvadorj et al., 2010) as well as by herders (Bruegger et al., 2014; Marin, 2010).

¹ The report provided animal numbers in 4 bod and 11 bog, Mongolian terms used for

Several external development organizations saw CBNRM to be a potential option to address these problems (Agriteam-Canada, 1997; Swift, 1995). Projects of the German Technical Cooperation (GTZ) and United Nations Development Program (UNDP) first introduced the community-based natural resource management model to Mongolia (Ministry of Nature and Environment, 2007; Schmidt, 2006; Upton, 2008). The process of engaging herder communities in natural resource management has further been expanded by other external donors, initially as aids to address consequences of dzud² in 1999-2001. These efforts have gradually led to institution-building objectives for rangeland management substantially weakened by the transitional reforms following the decollectivization and livestock privatization. According to a UNDP (2006) herder group assessment, there were 14 different programs facilitating the capacity building of over 2000 herder groups in 19 out of 21 provinces.

The results of CBNRM in Mongolia have been mixed, as is the case internationally. Currently, rangelands comprise about 83% of country's territory (Lkhagva et al., 2013) under *de-jure* state property, but *de-facto* communal regime of herder communities (Addison, 2012; Upton, 2008). Mongolian pastoralists still retain key herding strategies at mainly khot ail level but changes in practices have been noted as mentioned earlier. Although there was a report on reviving cooperation among neg nutgiinkhan (Mearns, 1996a), this has been contested by others (Bruun, 2006; Muller & Bold, 1996; Upton, 2011).

Despite the growing economic importance of the mining industry, the livestock sector accounts for 14% of Gross Domestic Production, and approximately 28% of the work force is directly dependent on this sector (Ganibal, 2015). In this context, scientific assessment of the CBNRM efforts is much needed to inform continuing external support to community-based institutions in Mongolia as well as ongoing policy debates on pasture land regulations. Recent studies contributed to this gap by providing

² Dzud is a Mongolian term for severe winter conditions with extremely low temperatures (possibly combined with climatic events such as snow blizzard or storm) that prevent livestock accessing forage causing starvation and freeze leading to mass mortality.

valuable insights for future policies for managing rangelands and for building adaptive capacities of pastoral institutions (Addison et al., 2013; Baival, 2012; Fernandez-Gimenez et al., 2014; Hess et al., 2010; Upton, 2008). However, existing studies have some limitations, such as small samples, dominance of case studies, and restricted geographic coverage, that may weaken the overall representativeness of the findings and their theoretical contributions. The following section will bring more detailed accounts on the recent assessments of community-based rangeland management in Mongolia.

1.2.7. Study of Mongolian CBRM.

Over the last decade, several scientific studies examined outcomes of herder groups facilitated by international agencies who responded to the need for addressing rural development issues of transitional Mongolia. Table 1.1 in Appendix displays the list of studies conducted so far with a brief summary including study subject, research method and study sites, and key results. A close examination of the table reveals several important trends in the current study of CBRM in Mongolia.

First, these studies all focused on outcomes and internal processes of donor-supported pastoral groups in Mongolia and related their outcomes to the pastoral institution development. However, few conceptually connected these donor-induced initiatives to community-based resource management. The majority were independent studies by western scientists published in peer-reviewed international journals, with the exception of two dissertations (Baival, 2012; Murphy, 2011), and a donor-funded assessment (Usukh et al., 2010). Among them, five publications had Mongolian researchers as first authors. The dominance of case studies was observed with exception of six mixed-method studies with sample sizes ranging from 50 to 280 informants. Unit of analysis was mainly individual herder or household level though some made conclusions at the group or institution level.

The studies covered sites of five donors including GTZ-funded New Zealand Nature Institute (NZNI) project, Sustainable Livelihood Program (SLP) of World Bank (WB), Rural Poverty Reduction

Program (RPRP) of International Fund for Agricultural Development (IFAD), Swiss Development Agency (SDC) funded Green Gold Pasture Ecosystem Management Project, and UNDP-funded Sustainable Grassland Management project. Herder groups facilitated by three donors, namely, GTZ/NZNI, UNDP and WB/SLP received greater research attention.

Geographically, studies covered three ecological zones including desert steppe, steppe and mountain forest steppe, among which the desert steppe was most studied. However, coverage of different ecological zones within a study remained limited; five studies examined outcomes in two ecological zones and only Usukh et al. (2010) included groups in four ecological regions in their study. In addition, thorough examination of potential influence of ecological zones on outcomes of community-based management has not been conducted.

Starting from Upton's early assessments (2008, 2009), most studies framed the process of group organization around rangeland management using commons theories, Ostrom's institutional design principles including resource characteristics, user groups' attributes, external social political context, and concepts of property rights, collective action, social capital, and social-ecological systems. Within these CPR-related theoretical frameworks, research inquiries comprised widely ranging topics including the role of external agencies in facilitating collective action and social capital among pastoral groups, evolving changes in property rights, rangeland management practices, community dynamics, equality, power relations, adaptive capacity and resilience of pastoral communities. Several studies examined outcomes of group collective action for rangeland management by measuring resource condition, livelihoods of members and their adaptive capacity in comparison to those outside of such donor-funded initiatives (Addison et al., 2013; Baival & Fernández-Giménez, 2012; Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012; Upton, 2008, 2011, 2012). Nonetheless, investigation of causal associations between these variables influencing CBRM outcomes or testing theoretical models predicting CBRM effect has been limited.

Despite the fact that all of them studied the same phenomenon occurring in the same time using common theoretical foundations, few explicitly defined the subject in association with CBRM. Terms used for naming for the study subject included community groups, herder groups, pasture user groups, cooperative groups, donor-initiated institutions, and community-based rangeland management groups. This diversity may reflect actual variety in the field settings that researchers found. Since the transition, there has been an explosion of different community-oriented programs in Mongolia with a wide range of sectors including health, education, small business, disaster, saving and credit, and many natural resource fields such as forestry, water, rangeland, and wildlife or biodiversity conservation. Under the global agendas of sustainable development discussed earlier, policies of the government of Mongolia and international donors have facilitated the growth of these programs. Hence, it is essential to distinguish among these community-oriented programs which may be considered as CBRM in the Mongolian context.

For instance, a more careful investigation of a few programs covered by CBRM studies in Table 1.1 could reveal an important clue. On the basis of my knowledge and experience of facilitating donor-supported herder groups in Mongolia, it is worth noting some differences between these donor programs, which have essential implications for the program implementation, hence facilitation of CBRM. Projects implemented by GTZ/NZNI, UNDP and SDC were technical assistance programs granted under strict monitoring and reporting requirements with clear outcome benchmarks by a primary funder or upper agency. These projects primarily aimed at building the capacity of Mongolian stakeholders including government offices of various levels and local resource users for sustainable resource management and rural livelihoods. In contrast, programs of the World Bank and IFAD were loans to the Government of Mongolia with poverty reduction objectives rather than resource conservation and management capacity building. The accountability for loan use and repayment obligations in specified timeframe rested solely with the Government. Hence, implementation and

monitoring of the program went through different levels of government. These programs did not include costs for initial participatory processes engaging local communities³, continuous facilitation of group development and regular monitoring. Accordingly, their results, when viewed from a CBRM perspective have been fairly poor (Murphy, 2011; Upton, 2011) and negative to the overall reputation of the CBRM efforts in the country. At this point, I can turn our discussions to the actual findings of the CBRM studies.

As reported, the majority of donors used participatory approaches for facilitating herder group formation, interactions among local stakeholders and trust-building (Baival, 2012; Leisher et al., 2012; Upton, 2008). Most CBRM efforts resulted in strengthened social capital, leadership, and organized cooperation by increasing members' access to training and peer learning and empowerment of women (Baival, 2012; Baival & Fernández-Giménez, 2012; Leisher et al., 2012; Upton, 2008). CBRM members increased their use of proven traditional rangeland practices while adopting new adaptive innovations for resource management (Baival, 2012; Baival & Fernández-Giménez, 2012; Fernandez-Gimenez et al., 2014) and improved pasture conditions and livelihoods in the forms of income and assets (Leisher et al., 2012). In addition, CBRM facilitated adaptive capacity of the members in the forms of income diversification, communal pooling of labor and marketing livestock products, and social networking for risk sharing (Baival & Fernández-Giménez, 2012; Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012; Upton, 2012). Regarding effect of CBRM on mobility and storage activities, some found no effect (Upton, 2012) while others revealed positive influence of CBRM in setting aside reserve pastures and fattening livestock by doing more movements (otor) (Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012). Groups' resilience built through CBRM has been rather limited as many activities ceased to almost non-existence with the end of the supporting projects (Addison et al., 2013; Baival, 2012; Upton, 2012).

³ Murphy (2011, p. 360) showed how IFAD program was announced in Uguumur soum.

There were no differences in wealth and age of CBRM members, but some reported a reluctance of wealthy households or those having sufficient labor force to join CBRM (Fernandez-Gimenez et al., 2014; Upton, 2008). Some conflicting results included outcomes in income diversity, livelihoods, pasture condition, the presence of sanctions, enforcement and group size (Addison et al., 2013; Fernandez-Gimenez et al., 2014; Leisher et al., 2012; Upton, 2008; Usukh et al., 2010). Comparative studies showed the presence of strong traditional knowledge, customary norms, reciprocal information sharing, mutual support (Baival & Fernández-Giménez, 2012), equity and the lack of conflict (Upton, 2011) among non-CBRM members. Regarding group size, Usukh et al. (2010) argued that larger groups had more potential for rangeland management than smaller groups as it enabled greater mobility. In contrast, Upton reported about a group disintegration, which was too large for effective management (Upton, 2008). Upton also concluded that compulsory membership to create larger groups was inefficient in terms of addressing intragroup dynamics, power relations and equity in resource access. Rather these groups looked more like “paper” groups (Upton, 2011). A few studies reported the ineffectiveness or perceived inappropriateness of collective pasture management in the desert steppe (Addison et al., 2013; Usukh et al., 2010).

Studies raised concerns over the cases of exclusion of non-members from accessing CBRM contracted pastures with delineated boundaries, haymaking areas or water sources improved by supporting donors leading to pasture disputes (Baival, 2012; Fernandez-Gimenez et al., 2008; Upton, 2008, 2009, 2011, 2012; Usukh et al., 2010). In several cases, it was hard for non-members to join already established CBRM groups (Upton, 2009, 2011). Such exclusion may increase inequality among community members, restrict mobility of non-members and threaten their livelihoods (Murphy, 2011; Upton, 2009, 2011)(Fernández-Giménez et al., 2012). For many herders, the main incentives for joining CBRM were access to collective labor, training opportunities (Upton, 2008), obtaining well contract with exclusive use rights, registering customary campsites, and acquiring a tractor for large-scale farming

(Murphy, 2011). Several studies pointed out constraints for organizing or joining CBRM such as the lack of information and leadership (Baival & Fernández-Giménez, 2012), inability to pay initial membership fee and inability to contribute to the group collective action lacking labor (Upton, 2008). CBRM implementation difficulties included setting boundaries of grazing areas for collective management, achieving goals of reducing livestock number to avoid overgrazing, marketing livestock products, poor financial capacity, and coordination of seasonal migrations at the inter-soum and aimag levels (Usukh et al., 2010).

Lastly, research highlighted the importance of supporting external agency, strong leadership and support of local government, and longer experience of cooperation (Fernandez-Gimenez et al., 2014; Usukh et al., 2010) for desired outcomes of emerging CBRM institutions.

The review of recent studies of CBRM experience in Mongolia revealed several gaps that need to be addressed. As Agrawal (2002) called for, quantitative examination of larger-*N* samples with greater power for generalization and validity is needed. Further, more research on causal relationships of influential factors such as ecological zones and testing of theoretical models for predicting CBRM outcomes are required. Importance of defining CBRM in the Mongolian pastoral context as well as measuring group level variables was also noted for the benefit of advancing the research in this field. Findings of the CBRM studies mirrored problems of the lack of understanding of specifics of pastoral social-ecological systems raised by Turner as shown in section 1.2.4. Reported attempts of formalizing exclusionary rights over rangeland resources and setting social boundaries possessing those rights have led to the same unintended negative outcomes as documented internationally. It is clear from the findings of these studies that CBRM in Mongolia is in its infancy. Many CBRM groups ceased their activities by the end of supporting donor programs and turned back to their traditional reliance on kin-based groups because they have not gained sufficient organizational strengths and capacity to continue in their own. The majority of members are still learning to be part of new self-governance institutions

and lack clear understanding of legal aspects of procedures like pasture contracts or making them effective preventing outsider encroachment as reported by researchers (Addison et al., 2013; Upton, 2011). The results also confirmed how absence of true participation of local resource users in decision making over access to government assistance and distribution can directly influence resource appropriation problems.

Mixed results of recent CBRM studies may reflect two realities. First is the timing of the research. Those assessments were conducted during the donor program may report more positive results reflecting perceptions of members enjoying benefits of collective action. In contrast, evaluations conducted after the end of donor program may show less enthusiastic pictures containing certain degree of members' frustration. Second is a question of research independence. Knowing Mongolian pastoralists' attitude and their delicate relationships with donor organization staffs, it is highly unlikely to obtain frank constructive responses to project related questions when former project workers act as data collection team members. To avoid this, the herders should be well assured that responses will not affect potential future benefits and create their trust in such promise. Hence, designs of future research may consider these facts to avoid confounding effect on their results.

CHAPTER TWO: DOES COMMUNITY-BASED RANGELAND MANAGEMENT INCREASE SOCIAL OUTCOMES OF PASTORAL GROUPS IN MONGOLIA?

Summary

This study measured social outcomes of community-based rangeland management in Mongolia by comparing 77 formally organized pastoral groups with 65 traditional neighborhoods. We used focus group discussions, key informant interviews with the group and local leaders, and synthesized qualitative information into a semi-quantitative group profile. In addition, we surveyed 706 households representing these groups in 36 districts across four ecological zones. We hypothesized that formal organization would increase groups' social outcomes. We found that formal groups had more information sources, stronger leadership, greater knowledge exchange, cooperation and more rules. Members of formal groups were more proactive in addressing resource management issues and used more desired rangeland practices than traditional neighborhoods. However, the two types of groups did not differ on most livelihood measures and had a weak difference in social capital. These results signify the increased social effect of formal community-based management approach but call for consideration of how to reach livelihood outcomes, a key incentive for community-based management.

2.1. Introduction

Community-based natural resource management (CBNRM) aims to manage resources sustainably through active participation of local community members in decision-making, while meeting ecological and socio-economic needs (Armitage, 2005; Berkes, 2004). As such, CBNRM has emerged as an alternative to state or market-driven management of common pool resources. Essentially, CBNRM draws on local people's intimate knowledge of their resources and strong motivation to conserve them due to substantial dependence for their livelihoods (Agrawal & Gibson, 1999). CBNRM advocates claim

that decentralization of management and devolution of tenure rights to local communities incorporating customary tenure systems leads to improved resource governance (Bennett, 2013; Pagdee et al., 2006). However, since donor-sponsored and exogenous CBNRM efforts began in the late 1970s, CBNRM has produced mixed results. On one hand, through increased engagement of local communities, CBNRM promoted positive behaviors and practices in managing natural resources, better decision making and contribution to the improvement of ecological and economic well-being in local areas (Lyons, 2013; Measham, 2007; Taylor, 2009). On the other hand, studies also reported unequal distribution of benefits among community members, or “elite capture” of gains and exclusion of disadvantaged community members (Balint & Mashinya, 2006; Cleaver, 2005; Duffy, 2006; Saito-Jensen et al., 2010). Moreover, the challenges of decentralizing resource management and defining social boundaries for exclusive membership have hindered CBNRM efforts (Agrawal & Gibson, 1999; Agrawal & Ostrom, 1999; Blaikie, 2006; Dressler et al., 2010).

There are noted flaws in research methodology for assessing CBNRM results (Agrawal, 2002; Agrawal & Chhatre, 2006). Case studies or small-N studies with limited geographic scope examining a single resource domain, have limited generalizability and representativeness (Poteete & Ostrom, 2008). In recent years, there have been an increasing number of larger-N studies employing both quantitative and qualitative methods, but similar inquiries have rarely been done in the rangelands context; the largest ecosystem globally (MEA, 2005).

To remedy these issues, we examined social outcomes of community-based rangeland management groups in Mongolia involving a sample of 142 groups and geographic coverage of four ecological regions (desert, steppe, eastern steppe and mountain forest steppe zones) across ten provinces.

Furthermore, Mongolia offers a unique opportunity for scientific research on CBNRM with its complex socio-ecological systems deeply embedded in the country’s distinctive historical past and

recent political and economic dynamics. In the early 1990s, Mongolia commenced social reforms towards neoliberal economic policies with a multi-party political system. As part of the society, Mongolian pastoral communities have gone through these abrupt social transformations. New socio-economic arrangements exacerbated by natural hazards substantially challenged rural communities for sustaining their livelihoods and rangeland resources. This process of adaptation has had important lessons to reflect through scientific and policy lenses. Therefore, Mongolian CBNRM case can represent pastoral communities with transitional experiences from the centrally planned economy in post-socialist countries. In this sense, revealing the effect of CBNRM on social outcomes of pastoral groups would contribute to enriching theories of common pool resource management (Ostrom, 1990, Agrawal, 2001).

In this report, we present the results of a comparative analysis of social outcomes of formally organized community groups in Mongolia initiated by external donors in the late 1990s. Social outcomes are defined here as any positive status in the social wellbeing of group members, including useful resource management practices, constructive behavior, improved social capital and livelihoods. Our main research question was “Does community-based rangeland management (CBRM) increase social outcomes of pastoral groups in Mongolia?” We considered groups *formally organized* or CBRM according to the members’ report of collective activities bound by bylaws and plans under the support of an external project. We hypothesized that formally organized groups would have greater social outcomes compared to traditional neighborhoods.

The paper is organized as follows. In the next section, we explain our conceptual framework by highlighting major theoretical and empirical arguments relating to successful CBNRM. We then present our methods, results and discussion of how these findings inform CBNRM theory and practice. We conclude with practical and policy implications.

2.2. Conceptual Framework

2.2.1. Organization of pastoral groups and characteristics of resources.

Figure 2.1 presents a graphical depiction of study's conceptual framework. The figure shows that two key variables, namely, organization status of the groups (formal vs. informal) and their location in a particular ecological zone primarily influences the levels of social outcomes of the pastoral communities.

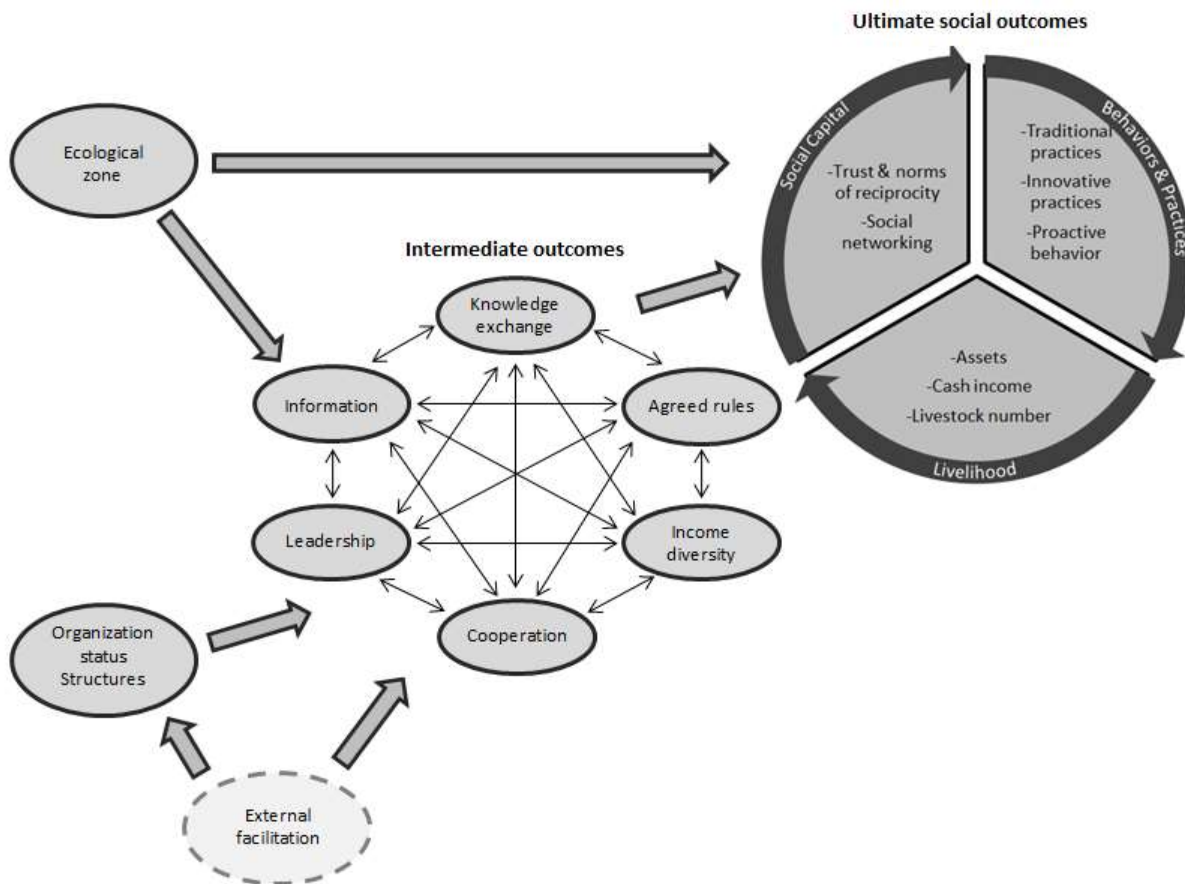


Figure 2.1. The conceptual framework depicts the effect of organization status on ultimate social outcomes through multiple mutually-enforcing intermediate outcomes as well as the effect of ecological zone on these social outcomes.

A body of literature suggests that under certain conditions, community-based management of common pool resources has positive outcomes. Despite the varying social and ecological settings of CBNRM globally, studies consistently point to the necessity of institutional arrangements or “sets of

formal and informal rules and norms that shape interactions of members with others and the nature” (Agrawal & Gibson, 2001, p. 14; NRC, 2002, p. 89; Pagdee et al., 2006) in any community context. Specifically, well-functioning rules to regulate behaviors of individual members with their potentially conflicting interests for meeting collective benefit have been a key element for successful, long-enduring resource institutions (Agrawal, 2002; Baland & Platteau, 1996; Ostrom, 1990). Such regulations limit free riding problems and punish those violating collective agreements (Agrawal & Gibson, 1999). Traditional norms shared by local resource users often promote conservation by prohibiting certain harmful behaviors, and for CBNRM development, the presence of such customary norms encourage cooperation on more formal arrangements to manage common resources (Agrawal & Gibson, 2001). In most situations, self-organized groups initially rely on their locally evolved norms of reciprocity, built trust, and local leaders before moving to a formal agreement among members. This formal arrangement involves regulations of more complex interactions such as restricting amount, timing, place of resource use, and sharing costs and benefits between themselves (Ostrom, 2000). As collaborative process advances towards a more developed form, the groups continue developing their rules to reflect various situations to be regulated improving rules content and making them more formal. From these two forms of rules, formally agreed-upon rules that were “devised and modified over time” (Ostrom, 1990, p. 89) by group members themselves according to their specific circumstances and collective choice appear to be given more weight than traditional norms.

Organization status in the conceptual framework contains these two forms of resource institutions; informal groups or traditional neighborhoods relying on customary norms and formal groups bound by their bylaws and resource use agreements. For the development of the latter, contextual factors (Agrawal, 2001) or external facilitation have played a triggering role in Mongolia. Pioneering technical assistance projects of the German Technical Cooperation (GTZ) and United Nations Development Program (UNDP) in late 1990s (Ministry of Nature and Environment, 2007; Schmidt, 2006)

first introduced CBNRM to Mongolia. The process of engaging herder communities in natural resource management has further been expanded by other external donors, initially as aids to address consequences of dzud⁴ in 1999-2001. These efforts have gradually led to institution-building objectives for rangeland management substantially weakened by the transitional reforms following the de-collectivization and livestock privatization. According to a UNDP (2006) herder group assessment, in 2006 there were 14 different programs facilitating the capacity building of over 2000 herder groups in 19 out of 21 provinces. To reflect this in the framework, external facilitation was included as an influencing variable for the organization status and the intermediate outcome variables. However, the variable will not be the subject of analysis in this chapter and is thus shown in a faded color.

Studies have increasingly acknowledged the importance of group attributes such as differing interests of members, their social status and roles in CBNRM outcomes (Agrawal & Gibson, 2001). Similarly, in Mongolian rangelands, a few studies reported about important roles of local leaders be they young dynamic herders, experienced elder members or women in rangeland management in evolving community groups (Ulambayar & Fernández-Giménez, 2013; Upton, 2008). Hence, we considered potential confounding effects of these structural features of user groups on social outcomes.

As predicted by the theories, we hypothesized that formally organized groups will demonstrate greater social outcomes as compared to informal groups. In terms of group structures, it is difficult to propose a clear direction of its effect on social outcomes in the absence of distinct structural attributes specific to formal and informal groups. Therefore, our examination will be exploratory nature.

We included ecological zone on the basis of the consistent theoretical argument that resource characteristics strongly influence management outcomes of commons institutions (Agrawal, 2001; Ostrom, 1990; Wade, 1988). Studies on Mongolian rangelands have found that desert steppe regions

⁴ Dzud is a Mongolian term for severe winter conditions with extremely low temperatures (possibly combined with climatic events such as snow blizzard or storm) that prevent livestock accessing forage causing starvation and freeze leading to mass mortality.

are dominated by non-equilibrium dynamics, with highly variable resource productivity controlled by rainfall variation and timing rather than livestock grazing (Fernández-Giménez, 1997; Okayasu et al., 2012; Wesche et al., 2010; Zemmrich, 2007). These scarce and uncertain resource attributes have shaped Mongolia's main pastoral strategies including high mobility, flexibility, diversification, storage and pooling (Brown et al., 2013; Fernandez-Gimenez et al., 2014). In turn, such strategies involve different economic and social inputs depending on ecological region of the resource users (Bazargur et al., 1989). For instance, herders in the desert steppe move longer distances and more frequently across large territories to access water sources and pastures as compared to those in the mountain forest steppe (Azarov, 1933; Simukov, 1934; Tsevel, 1940) (Jagvaral, 1974) in (Bazargur et al., 1989). Hence, moving in the desert steppe region requires more investments in terms of transportation, labor and time that directly impact economic outcomes of the pastoralists in this ecological zone.

Within existing studies on Mongolian rangelands, it is difficult to hypothesize influences of ecological zone on social outcomes. Apparently, there has been limited scientific attention to a the role of ecological system in shaping socioeconomic dimensions of rangeland management in Mongolia. Nevertheless, we anticipated greater effect of resource attributes or ecological zone on livelihood variables and rangeland practices. As explained above, we expected that in the desert steppe, the ecological zone variable may have a negative effect on livelihoods as compared to other three regions. In terms of intermediate outcomes, we predicted no effect of ecological zone on majority of variables but rules and cooperation. Due to scarce resources, herders in the desert steppe operate in smaller traditional units (one, two households together) than those in other regions (2-12 households) (Azarov, 1933) in (Bazargur et al., 1989) to avoid competition for scarce grazing resources. These conditions may limit their social interactions such as cooperation in daily activities and setting rules to apply in their herding practices.

2.2.2. Ultimate social outcomes.

As shown in Figure 2.1, we selected three sets of social outcomes as our dependent variables. Most evaluations of CBNRM consider livelihood outcomes and changes in resource conditions as key measures of CBNRM success (Conley & Moote, 2003; Hibbard & Lurie, 2012; Plummer & Armitage, 2007). However, following our research objectives, we focused on social outcomes related to social and economic well-being of Mongolian pastoralists rather than rangeland condition. Consequently, we conceptualized that livelihood, social capital and rangeland management practices and behavior present the ultimate social outcomes of CBRM institutions in Mongolia.

For Mongolian pastoralists, livestock is the primary asset that defines wealth and power (Murphy, 2014; Sneath, 1999). Access to technology and equipment is also important to household production. Essential assets such as vehicles, tractors, cell-phones and TV increase production capacity and herders' access to information, which is critical in vast sparsely populated areas. Possession of these assets, a viable number of livestock, and cash income determine the capability of rural herding communities to meet their subsistence needs and address risks under uncertain and variable environmental conditions (Fernandez-Gimenez et al., 2012; Fernandez-Gimenez et al., 2011). We anticipated that through increased information, communication exchange, and cooperation, members gain livelihood outcomes. Hence, we hypothesized that formal organization will positively influence members' cash income, per capita livestock holdings and ownership of essential assets.

Previous research suggests that community members engaged in cooperation under agreed-upon rules for managing common resources were more likely to adopt ecologically-friendly practices and behaviors for resource use (Batkishig, 2011; Ostrom & Hess, 2010; Upton, 2008). We considered two existing forms of rangeland practices in Mongolia. Traditional practices include those activities inherited from millennia-long adaptation of the Mongolian nomads to their lands (Fernandez-Gimenez, 2000), which are proven strategies for sustainable rangeland management (Fernandez-Gimenez, 2000,

2006). Innovative practices are more recently introduced by supporting donor agencies or government and include fencing key resource areas, monitoring pasture condition, improved animal breeding, and growing forage plants. All these incorporate technological developments that may be seen as “both a motor and a product of social change” (Sneath, 1999, p. 223). Additionally, individual member’s proactive behaviors on issues related to resource management are important in group collective action. Proactive behavior variable included members’ reports on their actions such as bringing a rangeland issue to the attention of local authorities, sharing own views and suggestions and joining collective actions for resource management. The greater a group’s use of traditional and innovative rangeland management practices and members’ proactive behaviors, the better their outcomes would be on the resources and indirectly on their livelihoods. Therefore, we hypothesized that the formal organization will increase the levels of management practices and behaviors among the members.

Theoretical models of the commons institutions emphasize social capital variables such as trust, norms of reciprocity and social networks of members in resource institutions that strongly influence the levels of both livelihoods and resource conditions. These three dimensions (Putnam, 1993) interact with each other and facilitate social outcomes through collective action and democratic governance (Titeca & Vervisch, 2008) while reducing its transaction costs (Ostrom, 1990). We adopted Uphoff et al’s (2000) concept of cognitive and structural social capital and measured both types among the group members. Trust and norms of reciprocity together with other social values are defined as cognitive social capital specific to the local (micro) individual level (Grootaert, 2002) “resulting from mental processes”. On the other hand, social networking is called structural social capital (Uphoff et al., 2000, p. 4). Structural social capital was further subcategorized as bonding (horizontal network of like-minded individuals with similar social status) and bridging (ties with actors from different social or cultural backgrounds) social capital” (Putnam, 2000, p. 22). For pastoralists, strong bonding and bridging social capital present essential risk management strategies important for overcoming both household-level risks and

community-wide covariate hazards such as dzud and droughts (Fernandez-Gimenez et al., 2012; Swift, 1995). This led us to hypothesize that the formal groups engaged in CBRM will have stronger social capital as compared to informal groups.

The conceptual model illustrates the internal dynamics of three dependent variables as explained above with their interdependence and mutually-enforcing nature. It also shows that ultimate social outcomes are dependent on ecological zone and organization status through a set of intermediate outcomes.

2.2.3. Intermediate social outcomes.

The intermediate outcomes shown in the middle of Figure 2.1 include six variables: access to information, local leadership, opportunity for knowledge exchange, cooperation and income diversification and a presence of rules to constrain resource use. Studies assessing successes of the CBNRM argue that these intermediate variables play an important role in ultimate achievements of CBNRM (Measham & Lumbasi, 2013) (NACSO, 2008; USAID, 2009).

Ostrom in her influential work (1990) showed that the ability to obtain and exchange credible information is an important factor for collective actions of local users. The same applies to Mongolian pastoral groups. In the post-socialist Mongolia, abrupt transitional reforms resulted in limited access to information, and lack of training and government services, and contributed to rural vulnerability (Marin, 2008; UNDP, 2011). With the demise of state-sponsored institutions in early 1990s, Mongolian herders lost their regular access to mail and newspaper delivery, local libraries, cultural clubs and mobile cinema⁵, that played a significant role in their daily activities and education as a population scattered across large areas with limited transportation and communication (Rossabi, 2005; Sneath, 1999).

⁵ In 1987 Mongolia had 455 cultural clubs, 498 mobile cinema projectors, and 404 libraries with at least one per each collective which were 255 at the time (Academy of Science, 1990).

The new market condition required pastoralists selling their products and purchasing necessities on their own while managing daily livestock herding tasks and responding to highly uncertain environments (Swift, 1995). In addition, herders lacked forums for discussion to share their issues and exchange ideas that would help them network with each other for handling all of the issues. Many externally-funded CBNRM programs (Upton, 2008; Usukh et al., 2010) were sought to target this gap initiating information delivery and local forums in remote rural communities.

During the socialist system, the state cooperatives provided leadership in rangeland management including allocation of pasture, coordination and support for seasonal movements, emergency assistance, training and education, marketing goods and social services (Fernandez-Gimenez, 1999; Rossabi, 2005). Most collective leaders were either experienced herders or professionals in livestock husbandry who had a strong knowledge of traditional practices and specifics of the local ecological conditions. Thus many customary forms of organization and resource use were reflected in cooperative management (Swift, 1995). A few recent studies reported deteriorating trust in local formal leaders as well as those wealthier community leaders showing rather individualistic strategies under the new market settings (Murphy, 2014; Upton, 2008).

Traditionally, Mongolian pastoralists cooperated regularly at different levels of rangeland institutions. At the neighborhood level, cooperation included coordinating use of pastures, hay areas, water sources, and salt licks, as well as labor sharing for nomadic movements, clearing pastures from snow, or searching for lost animals (Mearns, 1996b). Some authors noted revival of such traditional cooperation following decollectivization, which was weakened during the state cooperative times (Mearns, 1996a) but others contested the presence of such cooperation (Bruun, 2006). Recent assessments reported some forms of new cooperation encouraged by technical assistance projects (Upton, 2008; Usukh et al., 2010) such as fencing key resource areas for protection, monitoring pasture

condition, and planting vegetables. Based on the theories and empirical studies, we hypothesized that formal organization will increase all these intermediate outcomes of the pastoral communities.

In summary, we suggest that ultimate social outcomes of Mongolian pastoral groups are influenced by organization status and social structures of groups together with their location in specific ecological region. Furthermore, we argue that the formal organization of resource users leads to social outcomes in the forms of increased social capital, improved livelihoods, and resource management practices. However, such effects can be produced as a result of multiple intermediate outcomes of formal organization such as greater access to information, presence of leadership, knowledge exchange and agreed rules. Consequently, we hypothesize that formally organized CBRM groups will have greater levels of both intermediate and ultimate social outcomes as compared to informal non-CBRM groups.

2.3. Methods

2.3.1. Sampling.

We used a nested sampling design (Lieberman, 2005) including two different levels of social organization: household and community group. Local community groups are our primary unit of analysis. We adopted the definition of International Forestry Resources and Institutions (IFRI) for user group as “a set of individuals with the same rights and responsibilities to resources” (Poteete & Ostrom, 2003, p. 11). We sampled a total of 142 community groups ($N=142$) in 36 soums⁶ (counties) from 10 aimags⁷ (provinces) of Mongolia as shown in Figure 2.2.

We paired adjacent soums with (CBRM) and without (non-CBRM) formally-organized CBRM. CBRM groups comprised 54% ($N=77$) of the total sample, and the remaining 46% were traditional neighborhoods or non-CBRM groups ($N=65$). We purposively sampled formal groups associated with four different technical assistance organizations operating in Mongolia, namely, the Swiss Development

⁶ Soum is a rural district, the administrative unit below aimag (province).

⁷ Aimag is the largest administrative unit in Mongolia equivalent of province.

Agency (SDC), United Nations Development Programme (UNDP), New Zealand Nature Institute (NZNI) and Wildlife Conservation Society (WCS).

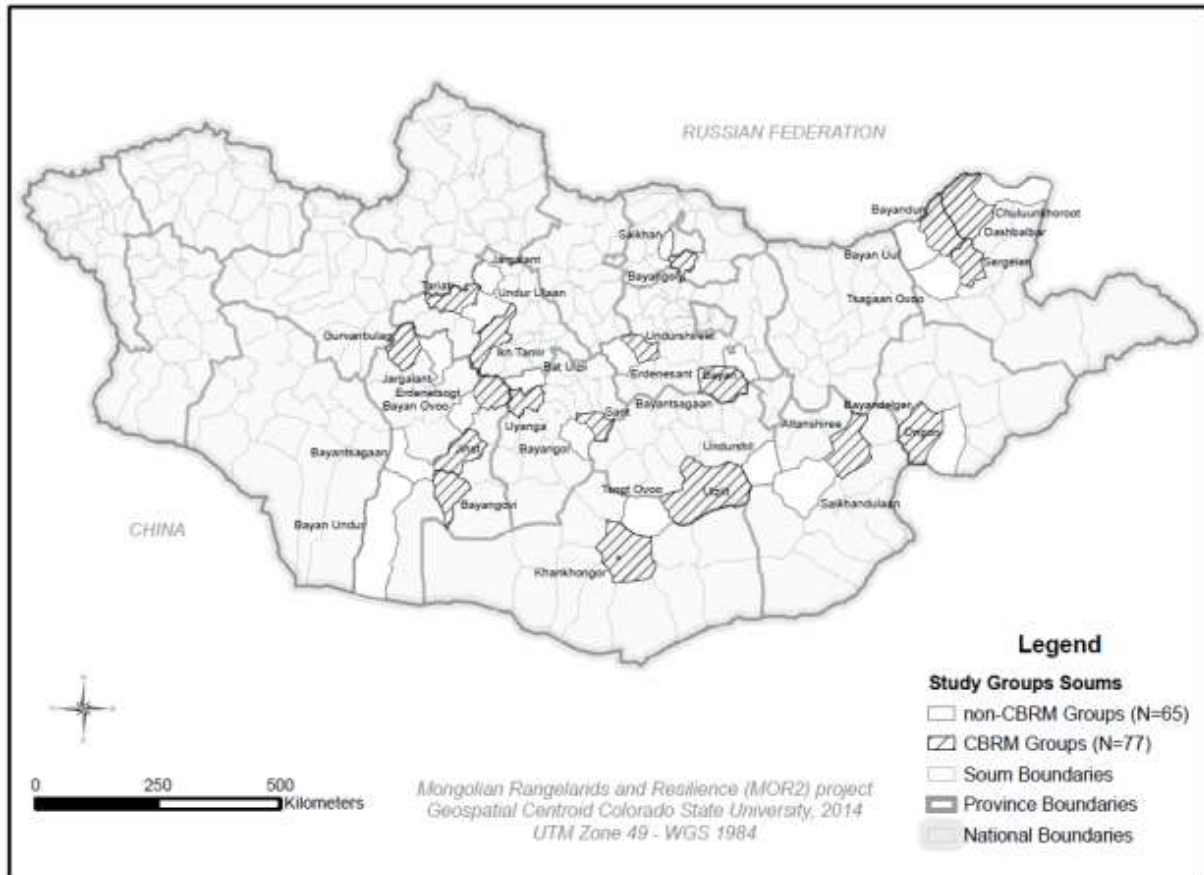


Figure 2.2. The location of the study soums (districts) that are paired (n=18) with community-based rangeland management (CBRM) groups (n=77) and without (non-CBRM) them (n=65).

Within each soum, we randomly selected one to nine community groups sharing common resources such as grazing areas and water sources. From each selected community group we interviewed on average five households. In donor-supported soums, household sampling was sometimes done differently depending on the size of a sampling frame. In SDC-supported soums, households were randomly selected from all herder households within the territorial boundaries of the group, which tended to follow administrative boundaries and include all households within the delineated territory. UNDP, NZNI and WCS projects had smaller sampling frames that limited the

potential for random selection. For these groups, we interviewed at least five members of each selected group. With this sampling approach, we interviewed a total of 706 households of which 382 (or 54%) were members of formal groups, and 324 (46%) were from traditional neighborhoods. The number of sampled households per group varied from 3 to 7.

2.3.2. Surveys.

Figure 2.3 summarizes our sampling design and data collection tools at each study level. We used two major instruments for data collection. Household interviews were quantitative questionnaires measuring household demographics, livelihood, rangeland management practices, norms and behaviors, and social networks. Information from these surveys was designed to help explain if group cooperation and activities influenced household-level practices and social-economic conditions. At the group level, we conducted interviews of community group leaders and focus groups with members. Based on information from member household questionnaires, focus groups and leader interviews, the study team completed an organizational profile instrument for each community group, which represented an initial synthesis of the field data about the group's characteristics, organizational management, social capital, leadership, governance and overall economic well-being. These organizational profiles together with the household surveys provide the primary data sources for this study. The design of instruments was based on the prior studies in Mongolia's rangelands (Fernandez-Gimenez, 2001; Fernandez-Gimenez & Batbuyan, 2004; Fernandez-Gimenez et al., 2012) and guided by the approach outlined by IFRI for data collection at the community level (IFRI, 2013).

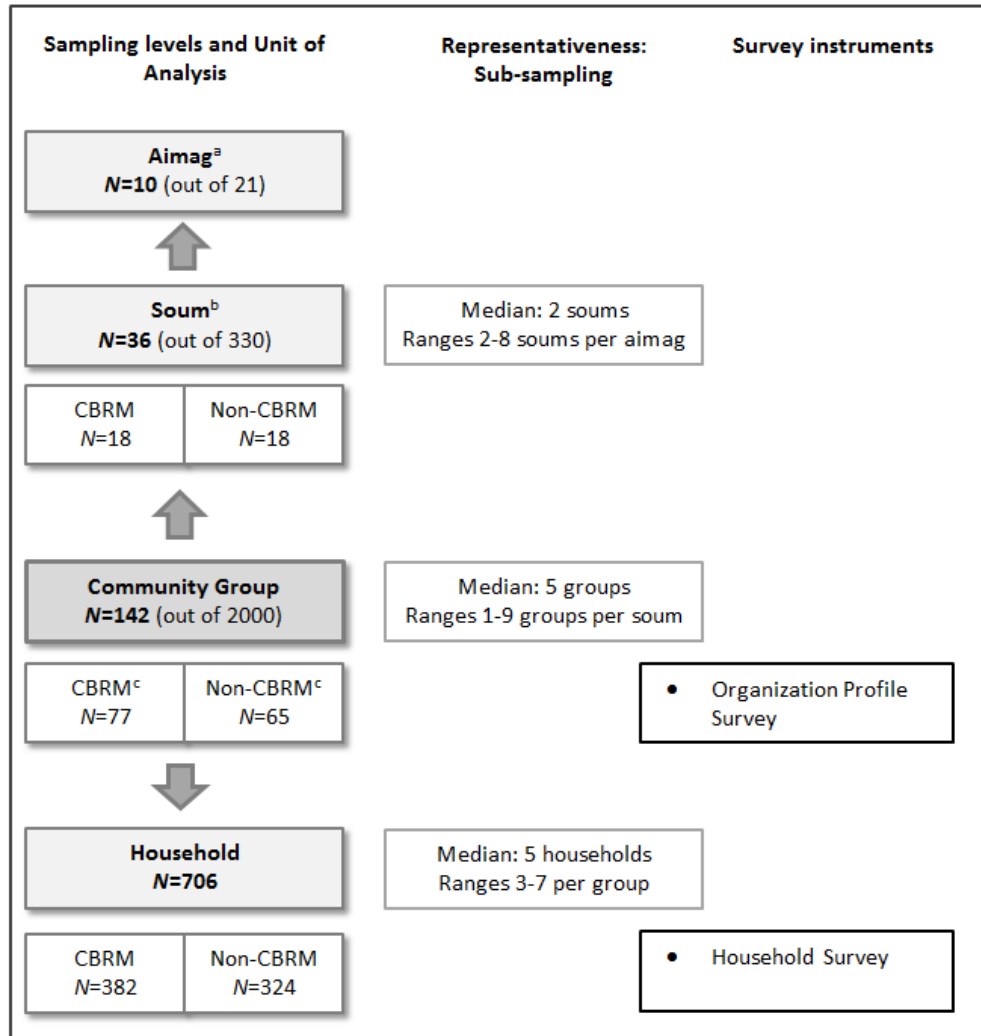


Figure 2.3. Sampling design and size, survey instruments used for the comparative study of pastoral groups (N=142) in Mongolia

^a Aimag is the largest administrative unit in Mongolia equivalent of province. ^b Soum is a rural district, the administrative unit below aimag. ^c CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups.

All the instruments were originally developed in English, and translated into Mongolian for the data collection. Instruments and the total field protocol were pre-tested in the field in April 2011 and revised before final implementation. Two teams of Mongolian social researchers collected data from April 2011 to June 2012. Then, we entered the collected data into two separate MS Access databases. Data were transferred to IBM SPSS 22 for analysis.

2.3.3. Variables.

Independent variables.

The main independent variables were organization status and ecological zone. The organization status was coded as either “no formal organization or non-CBRM” or “formal organization or CBRM.” Ecological zone included four categories: desert steppe, steppe, eastern steppe and mountain forest steppe.

Group attributes related to group structure included: group size (number of individual members and member households), group demography (members’ age, gender, ethnicity, education, employment, and housing), size of management areas or customary grazing territories as perceived by members, and members’ affiliation with various local associations.

Dependent variables.

Intermediate and ultimate social outcomes were our dependent variables. As shown in Table 2.1, intermediate outcome variables included information sources available to the members, perceptions about leadership including community and local government leaders, knowledge exchange within and outside of the group, agreed rules for rangeland management among members, income sources of the member households, and group cooperation.

The three of the intermediate outcome variables were dichotomous and indicated the presence of cooperation, sources of information, and sources of income. We measured two types of cooperative activities: a) traditional activities (16 items) that were typical in pre-collective and collective times, and b) relatively new activities (23 items) introduced since livestock privatization in the mid-1990s. These arenas of group-level cooperation are similar to two types of rangeland management practices measured at the household level.

Table 2.1. Descriptives of Variables used in the Analysis of Pastoral Groups in Mongolia (N=142)

Variable name	Description	M	SD	Range	Skewness
Independent variables					
Organization status	categorical; non-CBRM ^a vs.CBRM ^a				
Ecological zone	categorical; four ecozone types ^b				
Intermediate outcomes:					
Rules ^c	Mean of 5 types on a scale of 0-2	.43	.43	0-1.4	.93
Traditional cooperation ^d	Sum of 16 traditional cooperation	7.56	3.61	0-16	-.08
Innovative cooperation ^d	Sum of 23 innovative cooperation	5.60	4.05	0-18	.95
Cooperation	Sum of 39 cooperation types	13.16	7.09	0-31	.49
Information diversity ^e	Sum of 16 information sources	7.66	1.78	3-13	.30
Knowledge exchange ^{e,f}	Mean of 4 items on a scale of 0-2	.59	.34	0-1.5	.51
Income diversity ^e	Sum of 17 income sources	2.78	.52	1.8-4.0	.58
Leadership ^{e,g}	Mean of 4 items with 0-2 scales	1.14	.36	0-1.9	-.09
Ultimate outcomes:					
Livelihood:					
Assets ^e	Sum of 15 household assets	6.50	1.12	4-9	-.10
Cash income ^{e,h}	Per capita annual income in USD	207.84	354.02	0-1223	.40
Herd size ^{e,i}	Per capita livestock number in SFU ^j	124.89	70.79	14-302	.74
Cash income ^e	Log transformed cash income	6.57	.55	5.0-7.5	-.68
Herd size ^e	Log transformed herd size	4.70	.64	3-6	-.54
Social capital:					
Cognitive social capital ^{e,k}	Mean of 6 items	1.60	.31	.4-2.0	-1.17
Structural social capital ^e	Sum of 13 items	2.16	.82	.5-4.0	.26
Behavior:					
Traditional practices ^e	Sum 16 traditional practices	7.97	1.68	4-13	.06
Innovative practices ^e	Sum of 19 innovative practices	3.09	1.77	0.2-9.0	.93
Proactiveness ^e	Sum of 4 proactive items	1.47	.83	0-4.0	.56

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Ecological zones are coded: 1 = Desert Steppe, 2 =Steppe, 3 = Eastern Steppe, and 4 = Mountain Forest Steppe. ^c Rules is a group level variable coded as 0 = No Rules, 1 = Traditional or Informal Rules, 2 = Formal Rules. ^d Contributing variables for cooperation. ^e These variables from household survey dataset were aggregated to the organization level by taking the mean value for the sampled households within each organization or neighborhood group. ^f Knowledge exchange items were coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3< people). ^g Leadership items were coded as 0 = Disagree, 1 =Neutral and 2 = Agree. ^h This winsorized variable trimmed 3% of the distribution at each end and replaced those values with -1,195 and 2,283, the next valid values at each side of the distribution to address extreme outliers (Vaske, 2008, p. 562). ⁱ This semi-winsorized variable trimmed the upper 3% of the distribution and replaced those values with 555, the next valid value in the distribution to address extreme outliers (ibid.). ^j Sheep Forage Unit is used to estimate forage use by different types of grazing and browsing animals. In Mongolia 1 camel is equivalent of 5 SFU, 1 horse is 7 SFU, 1 cattle – 6 SFU, 1 goat - 0.9 SFU. ^k Cognitive social capital items were reverse coded as 0 = Agree, 1 = Neutral and 2 = Disagree.

However, we consider group-level cooperation as an intermediate variable and household level behavior as an ultimate outcome, using the logic that group cooperation in these areas motivates individual actions.

The remaining three intermediate variables had scales; knowledge exchange assessed if the members have someone to consult and exchange ideas on essential topics of rangeland management. Leadership measured the presence of legitimate local leaders. Lastly, agreed rules indicated the presence of rules for resource management as reported by herders.

Ultimate social outcomes comprised of three main categories: household-level livelihood, social capital, and rangeland practices and behaviors. Livelihood category was measured using three variables; possession of essential household assets, annual per capita net cash income in USD,⁸ and livestock number per household member (aka. per capita) in sheep forage units⁶. Cognitive social capital measured the level of trust and norms of reciprocity among group members. Structural social capital indicated the presence of bonding and bridging social ties of the members. Practices included reports of traditional and innovative rangeland management practices. Proactiveness measured members' actions and engagement in initiatives related to local rangeland issues.

As noted in Table 2.1, six of eight ultimate outcome variables were calculated from the household survey dataset. We aggregated household variables to the organization level by taking the mean value for the sampled households within each organization or neighborhood group.

The response rate was complete for most of the variables ($N=142$) except structural social capital. Table 2.1 displayed value ranges of the variables to give an idea about the location of the group mean for a particular variable along the existing interval. Skewness in the variables' curves was used to evaluate the normality of data distribution, where the values between +1.0 and -1.0 were considered

⁸ Cash values were converted to USD for two reasons: a) to reduce decimal numbers in MNT (Mongolian tugrik at the exchange rate of 1USD=1712 as of January 2014) and b) to ease reader's understanding of the values by expressing them in a more commonly used currency than MNT.

acceptable given robustness of parametric statistical tests (Vaske, 2008, p. 276). Reliability tests for the scale variables were performed to verify the internal consistency of items as shown in Table 2.2.

2.3.4. Data manipulation.

Two household level variables, namely, per capita cash income and per capita livestock number had very large standard deviations ($SD_{income}=1120.26$ and $SD_{herd}=183.62$) with several outliers ($\bar{X}_{income}=219.05$, $\bar{X}_{herd}=137$ respectively). Hence, we had to winsorize the detected outliers that were about 3% of their distributions. Specifically, per capita cash income was winsorized by trimming 3% of the distribution at each end (22 cases) and replaced those values with -1,195 and 2,283, the next valid values at each side of the distribution (Vaske, 2008, p. 562). Per capita livestock number was semi-winsorized (trimmed only in one end) as 0 value was true implying there were households with no livestock. Accordingly, 3% of the upper part of the distribution was replaced by 555, the next valid value. This greatly reduced standard deviations of these variables with moderate changes in their means ($\bar{X}_{income}=206.68$ with $SD_{income}=712.11$ and $\bar{X}_{herd}=127$ with $SD_{herd}=126.76$). Still the two variables had large unequal variances that violated assumptions for ANOVA tests used for examining differences in social outcomes accounting both factors of organization status and ecological zones. Hence, they were log transformed to satisfy the assumptions of homoscedasticity. For the same reasons, we also replaced a few large outliers in three organization level variables. In knowledge exchange; value of 2 replaced by 1.40 of case # 85, in rules; value of 1.85 replaced by 1.48 of case # 85, and in livestock unit; values in five cases 55, 25, 135, 57, 105 were replaced by 302, the next valid value in the distribution.

Table 2.2. Descriptives and Reliability of Items in Index Variables used for the Analyses

Variables, scales and items	<i>N</i> ^a	<i>M</i>	<i>SD</i>	Cronbach's <i>alpha</i> if item deleted	Cronbach's <i>alpha</i> ^f
<i>Knowledge exchange</i>^b:					.82
Livestock health, reproduction, and nutrition	703	.76	.65	.79	
Livestock marketing	702	.58	.69	.78	
Pasture rotation and resting	701	.51	.65	.75	
Disaster preparedness and risk management	701	.49	.64	.76	
<i>Cognitive social capital</i>^c:					.79
People always try to help each other	704	1.72	.64	.76	
People help each other in times of need	702	1.70	.63	.76	
Most people are trustworthy	703	1.76	.53	.76	
People mainly look out for themselves ^d	702	1.32	.83	.74	
People will take advantage of others ^d	702	1.61	.69	.75	
Our community is getting less friendly ^d	704	1.47	.76	.74	
<i>Leadership</i>^c:					.57
My community has good informal leaders	703	1.31	.86	.45	
My community has some knowledgeable and respected people	703	1.45	.84	.45	
I know helpful organizations in my soum	700	.67	.89	.55	
The local government pays attention and listens to us	700	1.09	.85	.54	
<i>Rules</i>^e:					.75
Rules exist to regulate the timing of grazing	142	.92	.75	.72	
Rules exist to regulate the number of livestock	141	.23	.50	.71	
Rules exist to regulate the type of livestock	140	.12	.41	.71	
Rules exist to regulate use of hay areas	139	.42	.66	.68	
Rules exist to regulate use of wells	138	.47	.63	.70	

^a Cell entries show sample sizes from two datasets: household survey (*N*=706) and organization profile survey (*N*=142). ^b Items were coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3+ people). ^c Items were coded as 0 = Disagree, 1 = Neutral and 2 = Agree. ^d Items were reverse coded as 0 = Agree, 1 = Neutral and 2 = Disagree. ^e Items were coded as 0 = No Rules, 1 = Traditional or Informal Rules and 2 = Formal Agreed Rules. ^f Cronbach alpha is a coefficient of reliability showing consistency among items within an index variable, where score greater than .65 is desirable (Vaske, 2008).

2.3.5. Analysis.

We tested the following hypothesis: CBRM groups will have greater intermediate and ultimate social outcomes as compared to traditional neighborhoods. We used *t* tests, chi-square tests and ANOVA to compare groups by organization type and four ecological zones (refer to Table 2.3). We chose

two-way ANOVA to compare levels of dependent social outcome variables by the two independent variables. For ecological zone comparisons, we used the Games-Howell post-hoc test because samples controlling two factors had unequal sizes and mostly unequal variances (Hilton & Armstrong, 2006).

When we found significant differences in the levels of intermediate and ultimate social outcomes, we further examined items of those statistically differing variables. This helped us to locate the exact differences between the organization types and ecological zones. For items' tests we mostly used crosstabs due to varying sizes of the groups where proportions were more relevant than nominal values. In cases of continuous structural variables we used *t*-tests. When we discovered statistical differences in many variables in the items' tests, we prioritized those differences with larger practical significance with higher effect size (Karabi, 2012; Vaske, 2008).

2.4. Results

In this section, we present our results of comparisons across three categories of independent variables: a) group structural variables, b) organization status and c) ecological zones.

2.4.1. Group structural characteristics.

An average traditional neighborhood group consisted of 10 households with 38 members while the formal groups were significantly larger, with an average of 29 households with 89 members (Refer to Table 2.4). On average, non-CBRM groups had 22 adult members and 16 children, while CBRMs had 51 adults and 38 children. The reported size for grazing area per member was larger for CBRM groups ($\bar{X}_{\text{non-CBRM}}=370.24$ ha vs. $\bar{X}_{\text{CBRM}}=440.76$ ha). Further examination revealed that the larger group size of CBRM groups was due to the size of pasture user groups (PUGs) supported by SDC program. As explained earlier, these territory-based groups with mandatory membership included all households residing

within the defined grazing territory that often overlaps with a smallest administrative unit or bag⁹ boundary (Usukh et al., 2010).

Table 2.3. Summary of Analysis Methods for Comparing the Two Types of Pastoral Groups

Variable name	IV ^a	DV ^b	t-test	χ ² test	ANOVA
1. <i>Intermediate outcome variables:</i>					
Rules		√			√
Income diversity		√			√
Knowledge exchange		√			√
Leadership		√			√
Cooperation		√			√
Information diversity		√			√
Items of Information diversity		√		√	
Items of Cooperation		√		√	
Items of Rules		√		√	
Items of Income diversity		√		√	
Items of Leadership		√			√
2. <i>Ultimate social outcome variables:</i>					
2.a Livelihood:					
Assets		√			√
Cash income		√			√
Herd size		√			√
2.b Social capital:					
Cognitive social capital		√			√
Structural social capital		√			√
2.c Behaviors and practices:					
Traditional practices		√			√
Innovative practices		√			√
Proactiveness		√			√
Items of Assets		√		√	
Items of Structural social capital		√		√	
Items of Cognitive social capital		√			√
Items of Rangeland practices		√		√	
Items of Proactiveness		√		√	
3. <i>Explanatory variables:</i>					
Organization status	√				√
Structural variables	√		√	√	
Ecological zone	√				√

^a Independent variable

^b Dependent variable

The ratio of male to female members in both group types was almost the same with a good balance (20 : 19 for non-CBRMs vs. 40 : 40 for CBRMs). Ethnically, the groups were fairly homogenous

⁹ Bag is a rural sub-district, the smallest administrative unit below soum

with the dominance of Khalkha members (92% for non-CBRMs and 95% for CBRMs) reflecting the national proportion (NSO, 2010).

The same pattern was observed in the reports of ger (traditional round-shaped housing) being the first most frequent housing in rural Mongolia (98.5% for non-CBRMs and 100% for CBRMs). Simple wooden house was the second most frequent housing for herders; 44% of traditional neighborhoods and 57% of CBRM had these structures.

Table 2.4. Comparison of Means for Group Characteristics Variables: Informal versus Formal Pastoral Groups Using *t*-tests and Chi-square Tests (N=142)

Structural variables	Unit	Non-CBRM ^a	CBRM ^a
Group size (households)	count	10*	29
Group size (individual members)	count	38*	89
Age (over 16)	count	22*	51
Age (below 16)	count	16*	38
Gender (male)	count	20*	40
Gender (female)	count	19*	40
Ethnicity (proportion of khalkha)	%	92	95
First most frequent housing (ger)	%	98.5	100
Second most frequent housing (wooden house)	%	43.8	57
Size of management area (per member)	ha	370.24	440.76
Herd size (per capita for 2011)	SFU ^b	139	133
Education (secondary)	%	76	66
Education (college)	%	4	5
Livelihood (wealthy)	%	12	15
Livelihood (average)	%	62	54
Livelihood (poor)	%	20	23
Livelihood (very poor)	%	6	7
Single woman-headed households	%	9	7
Household with no livestock	%	2	9
Household with non-herding occupation	%	5	4
Members' affiliation with local organization #1	%	17.8*	74.3
Members' affiliation with local organization #2	%	2.0*	13.2
Members' affiliation with regional/national organization #1	%	4.2	6.8
Members' affiliation with regional/national organization #2	%	0	.01

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Sheep Forage Unit is used to estimate forage use by different types of grazing and browsing animals. In Mongolia 1 camel is equivalent of 5 SFU, 1 horse is 7 SFU, 1 cattle – 6 SFU, 1 goat - 0.9 SFU (Ministry of Food and Agriculture of Mongolia, 2010).

* The means are significantly different at $p < .05$.

Both group types were very similar in their education level, wealth (proportion of wealthy, average, poor and very poor member households), and vulnerability (member households with single-woman heads and those with no livestock). The majority of surveyed herders had secondary education (76% of non-CBRM vs. 66% of CBRM members), and smaller percentage (4% in non-CBRM and 5% in CBRM) of them had college education.

Among well-being categories, the largest was the average income group (62% of non-CBRM and 54% of CBRM) and the second largest was poor group (20% and 23% respectively). Wealthy households had 12% and 15% share in their respective groups while the very poor families had the smallest portion of 6-7% correspondingly. In terms of more vulnerable members, 9% of non-CBRM and 7% CBRM households were led by single women, and 2% and 9% of member families of the corresponding groups had no livestock.

We also looked at membership affiliation of herders with local, regional or national level associations. Most frequently reported local associations included committees of women, seniors, interest groups for race horse coaching and pasture protection including their CBRM groups. Respondents named few national level organizations including environmental organizations and external donor projects such as the Green Gold Project of the SDC and Sustainable Livelihood Project of the World Bank. CBRM member households had significantly higher rates of membership in local associations as compared to the traditional neighborhoods; 74.3% of CBRM members belonged to at least one local association and 13.2% of them belonged to two local associations. Among non-CBRM members, 17.8% participated in one association and 2% of them affiliated to two local associations.

In summary, formal and informal groups had similar structural attributes except their size and membership in local associations. In the next section, we will report effects of organization status on both intermediate and ultimate social outcomes.

2.4.2. Effect of organization status.

2.4.2.1. Effect of organization on intermediate outcomes.

The test for the effect of organization status on the intermediate outcome variables given their locations across four ecological zones revealed a significant interaction effect of the two factors on two outcomes, namely, the presence of rules ($F=6.27, p<.01$) and cooperation ($F=4.77, p<.01$ shown in Figure 2.4). Formal organization increases the levels of agreed rules and cooperation among the members in all three non-desert ecological zones but not in the desert steppe. Both cooperation and rules had the largest effect size (.21 and .14 respectively).

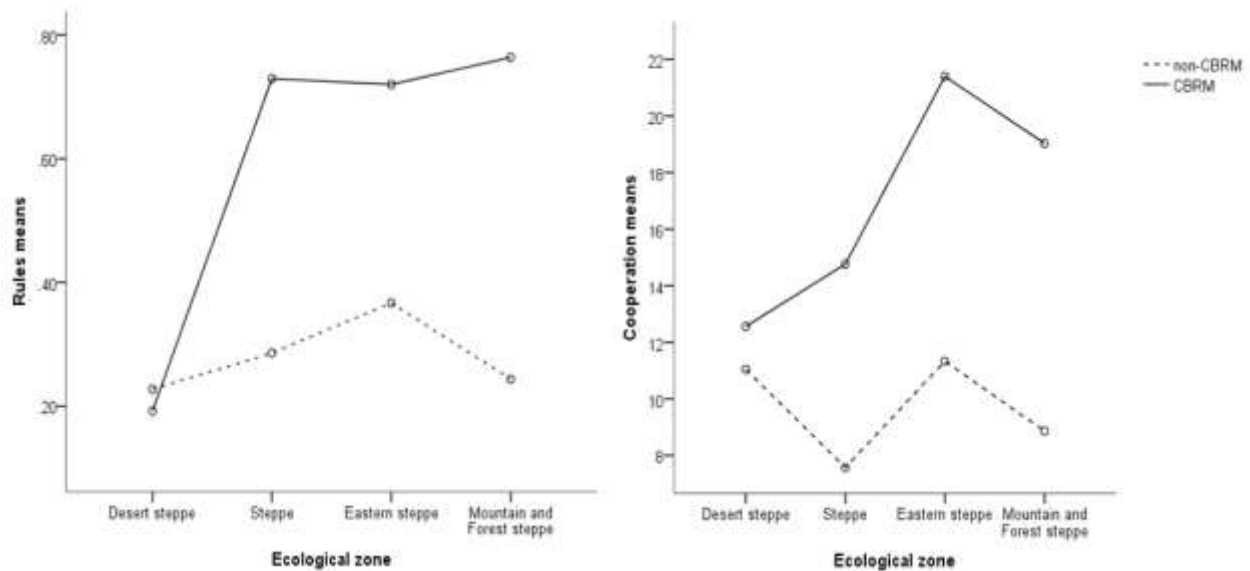


Figure 2.4. A visual representation of the significant interaction effect ($p<.01$) of organization status and ecological zone on the levels of agreed rules ($F=6.27, R^2= .37$, partial $\eta^2 =.12$) and cooperation ($F=4.77, R^2= .34$, partial $\eta^2 =.10$).

Table 2.5 shows significantly higher means for the formally organized groups in three other intermediate outcome indices: knowledge exchange, leadership and information diversity. Among these, information diversity had larger partial eta squared (.14) implying that the effect of organization status had greater practical significance.

Further examination of items within each intermediate outcome variable helps to explain the overall differences in outcomes. In the next subsections, we will describe the results by order of the practical significance of the statistical differences.

Table 2.5. Results of Two-way ANOVA-1 Showing Main Effect of Organization on Intermediate Outcome Variables (N=142)

Variable name	non-CBRM ^a	CBRM ^a	F	p-value	partial η^{2h}	R ²
Rules ^b	.26	.57	22.20	<.01	.14	.37
Knowledge exchange ^c	.48	.68	8.17	<.01	.06	.15
Leadership ^d	1.02	1.24	8.32	<.01	.06	.15
Income diversity ^e	2.73	2.82	3.63	.06	.03	.18
Information diversity ^f	6.82	8.38	21.86	<.01	.14	.24
Cooperation ^g	9.56	16.14	36.26	<.01	.21	.34

Note. ANOVA-1 tested $Y_{1-6} = X_1 + X_2 + X_1 * X_2$ where X_1 is “organization status”, and X_2 is “ecological zones”, and Y_{1-6} included rules, knowledge exchange, leadership, income diversity, information diversity and cooperation. The test also revealed a statistically significant interaction effect of organization status and ecological zones on rules and cooperation as shown in Figure 2.4.

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Rules is aggregated from household data and coded as 0 = No Rules, 1 = Traditional or Informal Rules and 2 = Formal Agreed Rules. ^c Knowledge exchange is aggregated from household data and coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3< people). ^d Leadership is aggregated from household data and coded as 0 = Disagree, 1 =Neutral and 2 = Agree. ^e Income diversity is aggregated from household data summing 17 income sources. ^f Information diversity is aggregated from household data summing 16 information sources. ^g Cooperation is sum of 39 cooperation activities at organization level. ^h Partial eta-squared is the proportion of the total variability attributable to a given factor (Karabi, 2012). The effect size is small if $\eta^2 < .50$, medium if $\eta^2 < .80$, and large if $\eta^2 > .80$.

Cooperation. Table 2.6 shows that traditional cooperation continues to be essential among the pastoralists from both group types. Prevailing traditional cooperative activities include repairing and maintaining wells (52% of non-CBRMs and 64% of CBRMs) and shelters and corrals (59% and 69% respectively), shearing sheep or combing cashmere (62% both), slaughtering animals (52% and 54%) and exchanging livestock with each other (56% and 71%). Interestingly, only 24% of non-CBRMs and 36% of CBRMs reported felt making, a common traditional cooperation.

Table 2.6. Comparison of Cooperation: Informal versus Formal Groups ($n_{\text{non-CBRM}}=65$ and $n_{\text{CBRM}}=77$)

Cooperation activities	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ^d
<i>Traditional cooperation:</i>					
Manage pastures together	36	68	14.01	<.01	.32*
Set aside and protect winter/spring pastures	47	68	6.6	.01	.22*
Set aside and protect dzud ^b reserve pastures	18	46	12.32	<.01	.30*
Manage well use among members	30	56	9.27	<.01	.26*
Repair or maintain a well or wells together	52	64	2.14	.14	.13
Restore or maintain a spring together	40	56	3.62	.06	.16
Make regular seasonal movements	45	57	1.96	.16	.12
Make otor ^c movements in emergencies	37	57	5.60	.02	.20*
Repair and maintain shelters and corrals	59	69	1.37	.24	.10*
Harvest hay together	36	54	4.51	.03	.18*
Prepare hand fodder together	13	29	5.58	.02	.20*
Shear sheep and comb cashmere	62	62	0.0	.99	0
Slaughter animals together	52	55	0.13	.72	.03
Make felt together	24	36	2.24	.13	.13
Lend livestock to each other	32	32	0.01	.93	0
Exchange livestock	56	71	3.47	.06	.16*
<i>Innovative cooperation:</i>					
Determined timing of pasture use	21	41	6.26	.01	.21*
Determine no. of livestock to be grazed	6	10	.48	.49	.06
Determined species or age of livestock	3	13	4.35	.04	.18*
Monitor pasture use	14	48	18.37	<.01	.36*
Sanction people who misuse pastures	2	23	13.41	<.01	.31*
Monitor pasture conditions	0	30	22.19	<.01	.40*
Determined use of specific water sources	24	32	.92	.34	.08
Determined use of other plant resources	6	18	4.33	.04	.18*
Determined use of wildlife	3	5	.35	.56	.05
Made rules about any other resources	2	8	2.99	.08	.15
Built fences to protect pasture, hay areas	8	42	20.59	<.01	.39*
Planted hay or fodder	5	21	7.76	<.01	.24*
Built fences to protect springs or streams	29	47	5.12	.02	.19*
Marketing or selling animal products	19	33	3.40	.07	.16
Distribute income from livestock products	5	7	.21	.64	.04
Sold hay or fodder harvested by the group	0	11	7.15	<.01	.23*
Distributed income from sale of hay/fodder	0	8	5.28	.02	.19*
Share equipment (e.g. tractor, truck)	35	58	7.29	<.01	.23*
Lend each other money	57	68	2.1	.15	.12
Arbitrated disputes among members/users	23	52	12.12	<.01	.30*
Interacted with soum/aimag government	42	74	13.14	<.01	.32*
Interacted with external organizations	15	64	34.35	<.01	.50*
Interacted with technical professionals	23	64	22.99	<.01	.41*

^a CBRM or Community-based Rangeland Management refers to formal groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Dzud is a Mongolian term for severe winter condition that causes mass mortality of livestock. ^c Otor refers to long distance movement of herders and livestock for search of better pastures. ^d Phi measures the association between two dichotomous variables. The effect size is "minimal" at .10, "typical at .30, and substantial at .50 or greater. * Indicates the statistical significance at $p<.05$ level.

CBRM groups reported significantly more cooperation in seven areas including managing grazing lands (68% versus 36% of non-CBRM), setting aside and protecting winter and spring pastures (68% versus 47%) and dzud reserves (46% versus 18%), managing commonly used wells (56% versus 30%), making winter *otor* (long distance movement of livestock and herders) in emergencies (57% versus 37%), harvesting hay (54% versus 36%) and preparing hand fodder (29% versus 13%). We note that the practical significance for managing pastures ($\varphi = .32$), setting aside and protecting dzud reserves ($\varphi = .30$), and coordinating well use ($\varphi = .26$) were largest among these cooperation types.

In terms of innovative cooperation, CBRM groups reported significantly greater participation in 17 out of 23 types of activities as compared to the traditional neighborhoods. Among these arenas of cooperation those with the largest effect sizes were interacting with external organizations (15% of non-CBRMs and 64% of CBRMs $\varphi = .50$), interacting with technical professionals (23% vs. 64% respectively with $\varphi = .41$), monitoring pasture condition (none vs. 30% of CBRMs $\varphi = .40$), protecting pastures and hay areas by fencing (8% vs. 42% $\varphi = .39$), monitoring pasture use (14% vs. 48% $\varphi = .36$), interacting with soum and aimag government ($\varphi = .32$), sanctioning those who misuse pastures (2% vs. 23% $\varphi = .31$), and arbitrating resource disputes (23% vs. 52% $\varphi = .30$). Formally organized groups predominantly cooperate in approaching local government officials (74%), lending money each other (68%), collaborating with external organizations (64%), consulting with technical experts (64%), sharing tractors, trucks and other equipment (58%), and resolving disputes among resource users (52%). While traditional neighborhood groups commonly cooperated for only two innovative types; lending each other money (57%) and approaching local government (42%).

Table 2.7. Comparison of the Presence of Agreed Rules Items by the Group Types Using Chi-square Test

	% non-CBRM ^a (n=65)			% CBRM ^a (n=77)		
	No rule	Informal	Formal	No rule	Informal	Formal
Timing of grazing	48 ^{b***}	51 ^{e*}	2 ^{g**}	20 ^{b***}	36 ^{e*}	44 ^{g**}
Number of livestock	84	16	0 ^{h**}	78	16	7 ^{h**}
Types of livestock	98 ^{c***}	2 ^{f**}	0 ^{i*}	84 ^{c***}	11 ^{f**}	5 ^{i*}
Use of hay areas	73	27	0 ^{j**}	61	21	17 ^{j**}
Use of wells	69 ^{d*}	30	2 ^{k*}	53 ^{d*}	35	12 ^{k*}

Note. Cell entries show the percent of members who checked this option (within an organization type).

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal (traditional neighborhoods) groups. ^b Effect size (phi) was measured showing the association between two dichotomous variables. The effect size is “minimal” at .10, “typical at .30, and substantial at .50 or greater (Vaske, 2008). The effect size here was .30. ^c The effect size was .24. ^d The effect size was .16. ^e The effect size was .15. ^f The effect size was .18. ^g The effect size was .49. ^h The effect size was .18. ⁱ The effect size was .16. ^j The effect size was .30. ^k The effect size was .20.

*, ** and *** indicate the statistical significance at the $p < .10$, $.05$ and $.01$ levels.

Presence of rules. Table 2.7 illustrates proportions of members reporting if the group had no rules or informal or formal rules in five resource regulation areas. Significantly more traditional neighborhoods lacked rules for timing of grazing (48%) and type of livestock (98%) as compared to CBRMs (20% and 84% respectively). Among non-CBRM groups 73% had no rules for use of hay areas and 69% - for use of wells. Similarly, for CBRMs, 84% of groups do not have rules for livestock types and numbers (78%) than rules for grazing timing. Over half of the formal groups have no rules for well use (53%) and hay areas (61%).

Regarding the presence of informal rules, significantly more traditional neighborhoods reported having informal rules for grazing timing (51%) compared to formal groups (36%). However, significantly more number of the latter (11% vs. 2%) reported having informal rules for livestock types. The table also shows that both groups have more informal rules to coordinate timing of grazing (36 to 51%) and well use (30 to 35%) than other three resource regulation areas (2 to 27%).

Formal rules were virtually absent among traditional neighborhoods; only 2% reported the presence of formal agreements for coordinating grazing timing and well use. Respectively, formal groups had significantly higher percentage of those reporting formal rules for all five areas: grazing timing

(44%), hay areas (17%), wells (12%), and number (7%) and types (5%) of livestock. Despite the greater number of reports for having formal rules in all five areas of resource regulation, the overall CBRM percent was fairly low (less than 44%).

We found larger effects sizes for the differences for having no rule for grazing timing (typical), formal rules for hay areas (typical) and formal rules for grazing timing (almost substantial).

Information diversity. CBRM members had significantly greater access to nine information sources: TV, newspaper or magazines, brochures or handbooks, experts/professionals, local veterinarians, CBRM meetings, soum and aimag level training and other sources. Table 2.8 illustrates that, CBRM meetings ($\varphi = .59$), soum training ($\varphi = .27$), experts or professionals ($\varphi = .19$) and training outside soum ($\varphi = .17$) had larger effect sizes. Furthermore, TV, local government officials, soum and bag⁵ meetings, and neighbors in khot ail¹⁰ and adjacent community, remain the major information sources for herders in both group types, where most of sources were local except TV.

Income diversity. We found no significant difference in the mean values for overall income diversity between the two group types. However, a closer examination of the items revealed differences in few income sources. As illustrated in Table 2.9, significantly higher percentage of herders in formally organized groups have income generated from vegetable farming (6% versus 3% of non-CBRMs) and some other income generation activities (8% versus 3% respectively). The herders from traditional neighborhoods were more involved in artisanal mining (8% versus 3% of CBRMs). However, effects sizes for the differences were small: $\varphi = .14$ for vegetable farming, $.11$ for other income sources, and $.10$ for mining.

¹⁰ Khot ail is a primary social unit in rural Mongolia consisting of 2-12 families of kin or close friends sharing daily tasks and pasture resources (Bazargur et al., 1989)

Table 2.8. Comparison of Information Sources for Member Households of Informal and Formal Pastoral Groups ($n_{\text{non-CBRM}}=314$ and $n_{\text{CBRM}}=392$)

Sources of information	Organization status		χ^2	p	ϕ^d
	% non-CBRM ^a	% CBRM ^a			
Radio	72	70	.27	.61	-.02
Television	89	94	5.76	.02	.09*
Newspapers, magazines	23	37	16.53	<.01	.15*
Computer or internet	2	1	1.83	.18	-.05
Brochures or informational handbooks	27	37	8.86	<.01	.11*
Experts or professional people	17	33	25.10	<.01	.19*
Soum ^b or bag ^c governor	72	75	1.14	.29	.04
Local veterinarians	59	67	5.21	.02	.09*
Herders in your khot ail (camp)	88	86	.18	.69	-.02
Herders in your neighborhood	86	84	.40	.53	-.02
Herders from outside your neighborhood	28	23	1.86	.17	-.05
Soum or bag meeting	77	80	1.19	.28	.04
CBRM ^a organization meeting	13	72	241.38	<.01	.59*
Formal training or seminar in your soum	18	44	51.35	<.01	.27*
Formal training or seminar outside your soum	7	19	19.48	<.01	.17*
Other information source	4	13	16.24	<.01	.15*

Note. Cell entries show positive responses.

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Soum is a rural district, the administrative unit below aimag (province). ^c Bag is a rural sub-district, the smallest administrative unit below soum. ^d Phi measures the association between two dichotomous variables. The effect size is “minimal” at .10, “typical at .30, and substantial at .50 or greater (Vaske, 2008).

* Indicates the statistical significance at $p < .05$ level.

Leadership. The examination of leadership items (Tables 2.10) revealed that CBRM groups had significantly higher level of leadership only because they reported having helpful organizations in their soum ($\bar{X}_{\text{non-CBRM}}=.33$ versus $\bar{X}_{\text{CBRM}}=.98$) at $p < .01$. Otherwise, the groups did not differ in terms of having good informal leaders ($\bar{X}_{\text{non-CBRM}}=1.28$ versus $\bar{X}_{\text{CBRM}}=1.35$, $p=.46$) and knowledgeable respected individuals ($\bar{X}_{\text{non-CBRM}}=1.42$ versus $\bar{X}_{\text{CBRM}}=1.48$, $p=.47$) and local government officials ($\bar{X}_{\text{non-CBRM}}=1.04$ versus $\bar{X}_{\text{CBRM}}=1.15$, $p=.19$) who listen to them.

Table 2.9. Comparison of Income Sources of Member Households of Informal ($n=314$) versus Formal ($n=392$) Pastoral Groups

Sources of income	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ^b
Livestock	99	99	1.24	.27	-.05
Pension	30	30	0	.96	0
Herding others' livestock	5	5	.02	.88	0
Government allowances	99	98	.86	.35	-.04
Vegetable farming	1	6	13.96	<.01	.14*
Salary	9	8	.57	.45	-.03
Remittances	1	3	2.46	.12	.06
Wage labor	3	4	.08	.79	.01
Rent	0	0	.80	.37	.03
Mining	8	3	7.39	<.01	-.10*
Loan interest	1	0	2.5	.11	-.06
Handicrafts	3	6	4.15	.04	.08*
Hunting	0	1	1.22	.27	.04
Aid from development organization	1	2	3.13	.08	.07
Small business	3	5	3.49	.06	.07
Family and friends	7	4	1.89	.17	-.05
Other income source	3	8	8.29	<.01	.11*

Note. Cell entries show positive responses.

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Phi measures the association between two dichotomous variables. The effect size is "minimal" at .10, "typical" at .30, and substantial at .50 or greater (Vaske, 2008).

*Indicates the statistical significance at $p < .05$ level.

Table 2.10. Comparison of Items of Leadership Using ANOVA ($N=706$)

Items	Non-CBRM ^a	CBRM ^a	F	p	η^{2b}
My community has good informal leaders	1.28	1.35	.56	.46	.004
My community has some knowledgeable and respected people	1.42	1.48	.53	.47	.004
I know helpful organizations in my soum	.33	.97	60.40	<.01	.301
The local government pays attention and listens to us	1.04	1.15	1.71	.19	.012

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Partial eta-squared is the proportion of the total variability attributable to a given factor (Karabi, 2012). The effect size is small if $\eta^2 < .50$, medium if $\eta^2 < .80$, and large if $\eta^2 > .80$.

2.4.2.2. Effect of organization on ultimate outcomes.

The test for the effects of organization status and ecological zones on ultimate social outcome variables, did not find interaction effects between the two factors. Hence, first, we will report results on

the main effect of organization status on ultimate social outcomes as shown in Table 2.11. We will introduce the main effects of ecological zones on ultimate social outcomes in the next section.

We found no effect of organization status on per capita cash income or livestock number, but a modest difference in possession of essential assets. Members of traditional neighborhoods had, on average, 6 assets while those from CBRMs had 7 of them ($F=.4.07$ at $p=.05$) with almost no practical significance (partial $\eta^2=.03$).

In social capital variables, there was a weak effect of organization status on the two variables: in cognitive social capital ($\bar{X}_{\text{CBRM}}=1.64$ versus $\bar{X}_{\text{non-CBRM}}=1.55$) at $p=.06$ and in structural social capital ($\bar{X}_{\text{non-CBRM}}=2.00$ versus $\bar{X}_{\text{CBRM}}=2.31$) at $p=.07$.

In behavioral variables, organization status showed a significant main effect on all three measures. Households from CBRM groups reported to have significantly more traditional ($\bar{X}_{\text{non-CBRM}}=7.40$ versus $\bar{X}_{\text{CBRM}}=8.45$) and innovative ($\bar{X}_{\text{non-CBRM}}=2.43$ versus $\bar{X}_{\text{CBRM}}=3.64$) rangeland management practices and proactive actions ($\bar{X}_{\text{non-CBRM}}=1.06$ versus $\bar{X}_{\text{CBRM}}=1.81$, $p<.01$).

We found larger effect sizes for these significant differences in proactiveness (.17 or large), innovative and traditional rangeland practices (.07 and .06 respectively, both medium), and structural social capital (.09 or medium).

In a similar manner as we analyzed intermediate outcomes, we further tested items of ultimate social outcomes with statistically significant effects of organization status. We report first results of items of ultimate social outcomes with larger practical significance.

Proactive behavior. The herders from formally organized groups demonstrated significantly greater proactive behavior as shown in Table 2.12. Thirty-three percent of CBRM herders talked with experts about rangeland issues compared to 19% of non-CBRM members. Fifty two percent of herders in formal groups joined local initiatives for improving resource use as opposed to 19% of non-CBRMs. Forty two percent of CBRM members joined actions to address local problems while only 21% of non-CBRM

herders did this. The difference in joining local collective actions had a medium effect size of .34, and other activities had smaller effect sizes ranging from .05 to .22.

Table 2.11. Results of Two-way ANOVA-2 Showing Main Effect of Organization Status on Ultimate Social Outcome Variables (N=142)

	Non-CBRM ^a	CBRM ^a	<i>F</i>	<i>p-value</i>	partial η^2	<i>R</i> ²
<i>Livelihood</i>						
Assets ^b	6.32	6.65	4.07	.05	.03	.10
Cash income ^c	6.45	6.50	.04	.85	<.0	.14
Livestock number ^d	4.68	4.62	.25	.62	<.0	.01
<i>Social capital</i>						
Cognitive ^e	1.55	1.64	3.65	.06	.03	.08
Structural ^f	2.00	2.31	3.34	.07	.09	.14
<i>Behavior</i>						
Traditional practice ^g	7.40	8.45	8.44	<.01	.06	.28
Innovative practice ^h	2.43	3.64	9.60	<.01	.07	.15
Proactiveness ⁱ	1.06	1.81	27.25	<.01	.17	.25

Note. ANOVA-2 tested $Y_{1-8} = X_1 + X_2 + X_1 * X_2$ where X_1 is "organization status", and X_2 is "ecological zones", and Y_{1-8} included assets, cash income, per capita livestock number, cognitive and structural social capital, traditional and innovative practices and proactiveness.

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Assets is aggregated from household data and sum 15 household items. ^c Cash income per capita is household level log transformed and winsorized variable trimmed 3% of the distribution at each end and replaced those values with -1,195 and 2,283, the next valid values at each side of the distribution to address extreme outliers (Vaske, 2008 p.562). ^d Livestock number per capita is household level log transformed and semi-winsorized variable trimmed the upper 3% of the distribution and replaced those values with 555, the next valid value in the distribution to address extreme outliers (ibid). ^e Cognitive social capital is aggregated from household data and reverse coded: 0 = Agree, 1 = Neutral, and 2 = Disagree. ^f Structural social capital is aggregated from household data and sum of 13 bonding bridging items. ^g Traditional practice is aggregated from household data and sum of 14 traditional rangeland management activities. ^h Innovative practice is aggregated from household data and sum of 21 innovative activities. ⁱ Proactiveness is aggregated from household data and sum of four proactive behaviors.

Table 2.12. Comparison of Items for Proactive Behavior Among Member Households of Informal ($n=314$) versus Formal ($n=392$) Pastoral Groups

Items of proactive behavior	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ
Talked to local authority about problems	47	52	1.88	.17	.05
Talked to experts about rangeland issues	19	33	16.11	<.01	.15*
Joined in collective rangeland improvement initiatives	19	52	81.52	<.01	.34*
Joined with community to address any other problem	21	42	33.14	<.01	.22*

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups.

* Indicates the statistical significance at $p<.05$ level.

Rangeland management practices. Table 2.13 demonstrated that a significantly higher percentage of CBRM members reported reserving winter pastures (57% versus 47% of non-CBRMs), spring pastures (49% versus 38%), and dzud¹ pastures (32% versus 24%), culling unproductive animals before winter (68% versus 55%), making hay (79% versus 63%) and hand fodder (48% versus 34%), and digging new wells (21% versus 13%). The practical significance of these differences was small with ϕ ranging between .09 and .18. The prevailing traditional practices among herders from both group types included purchasing and storing grains (76% of non-CBRMs and 77% of CBRMs), cutting hay (63% and 79% respectively), vaccinating their livestock (88% and 90%) and deworming them (87% and 89%). About 40% of herders in each group type reported doing fall and summer otor (38% and 39%).

Regarding innovative practices, significantly more CBRM members reported practicing 11 out of 19 types of new practice compared to those in traditional neighborhoods. Particularly, important ones were improving sheep (45%) and growing vegetables (31%). The most common innovative activity among traditional neighborhood members was improving sheep (34%) and goat (38%) breeds. The effects sizes of differences in rangeland management practices were minimal reaching .23 as the highest for fencing.

Structural social capital. We found no differences between the two groups in their bonding social capital as shown in Table 2.14. Herders from both group types largely rely on assistance of their neighbors (67%

of non-CBRM and 64% of CBRM) and relatives in their soums (60% vs. 63% respectively). Regarding the bridging social capital, significantly more CBRM herders reported help from a formal CBRM organization (5% versus 44% of CBRMs). Also their connections with religious leaders were modestly higher than members of traditional neighborhoods (4% versus 8%). The difference in obtaining aid from a CBRM organization had a medium practical significance ($\varphi = .43$) and minimal for their relationship with religious leaders $\varphi = .09$.

Cognitive social capital. From six items on trust and the norms of reciprocity among the members, two items had significantly greater values for CBRM herders (Table 2.15). They acknowledged that people in their area always try to help each other ($\bar{X}_{\text{non-CBRM}} = 1.65$ versus $\bar{X}_{\text{CBRM}} = 1.78$, $p < .03$) and disagreed with the statement of people being selfish ($\bar{X}_{\text{non-CBRM}} = 1.22$ versus $\bar{X}_{\text{CBRM}} = 1.41$, $p > .01$). These differences had a small practical significance (.03 and .04).

Table 2.13. Comparison of Items for Rangeland Management Practices by Member Households of Informal ($n=314$) versus Formal ($n=392$) Pastoral Groups

Rangeland management practices	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ
<i>Traditional practices:</i>					
Reserve winter pasture	47	57	7.43	.02	.10*
Reserve spring pasture	38	49	10.96	<.01	.13*
Reserve dzud ^b pasture	24	32	5.72	.06	.09
Do fall (or summer) otor ^c	37	39	2.47	.29	.06
Do winter otor ^d	17	22	4.29	.12	.08
Cull (sell/slaughter) unproductive animals	55	68	14.76	<.01	.15*
Cut hay	63	79	24.02	<.01	.18*
Prepare hand fodder	34	48	13.75	<.01	.14*
Purchase and store grain	76	77	.50	.78	.03
Purchase and store concentrate	35	40	2.41	.30	.06
Purchase other feed	19	24	3.06	.22	.07
Vaccinate livestock	88	90	3.19	.20	.07
Deworm livestock	87	89	.33	.85	.02
Treat livestock for external parasites	57	61	.83	.66	.03
Dig a new well	13	21	7.60	<.01	.10*
Repair existing well	48	51	2.84	.24	.06
<i>Innovative practices:</i>					
Improve camel breed	2	2	.10	.76	-.01
Improve horse breed	15	15	0	.95	-.00
Improve cattle breed	11	13	.87	.35	.04
Improve sheep breed	34	45	4.74	.03	.08*
Improve goat breed	36	41	1.80	.18	.05
Intentionally change species proportion	25	27	2.23	.33	.06
Sell animals to reduce herd size	21	28	5.88	.02	.09*
Intentionally not breed animals due to dzud	19	18	.30	.58	-.02
Fence pasture	6	22	40.87	<.01	.23*
Fence hay area	3	16	36.55	<.01	.22*
Fence or improve natural water sources	15	22	5.29	.07	.09
Plant fodder or grass	4	13	17.98	<.01	.16*
Use fertilizer	7	17	17.67	<.01	.13*
Use irrigation	5	12	12.12	<.01	.13*
Plant garden for food	16	30	19.82	<.01	.17*
Take other action to protect key resources	10	19	10.95	<.01	.13*
Take action to reduce soil erosion	4	8	6.06	.05	.09*
Take action to restore damaged lands	5	4	.22	.64	-.02
Take part in monitoring of resources	5	13	17.21	<.01	.16*

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Dzud is a Mongolian term for severe winter condition that causes mass mortality of livestock. ^c Otor refers to long distance movement of herders and livestock for search of better pastures.

* Indicates the statistical significance at $p<.05$ level.

Table 2.14. Comparison of Structural Social Capital Items: Member Households of Informal ($n=314$) versus Formal ($n=392$) Pastoral Groups

Items of structural social capital	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ
<i>Bonding social capital:</i>					
Help from neighbors	67	64	.32	.57	-.03
Help from family in soum ^b	60	63	.47	.49	.03
Help from family in aimag ^c center or the capital Ulaanbaatar	39	42	.73	.39	.04
Help from distant relatives	16	21	2.55	.11	.07
Help from friends	52	56	.56	.45	.03
<i>Bridging social capital:</i>					
Help from local/national government	63	64	.01	.92	.01
Help from politicians	38	31	2.45	.12	-.07
Help from religious leaders	4	8	3.80	.05	.09*
Help from CBRM organization	5	44	95.43	<.01	.43*
Help from development or aid organization	33	36	.49	.48	.03
Help from non-governmental organization	10	15	3.61	.06	.08
Help from banks	19	22	.62	.43	.04
Help from insurance companies	5	8	1.28	.26	.05

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Soum is a rural district in Mongolia below a province. ² Aimag is the largest administrative unit equivalent of a province.

* Indicates the statistical significance at $p < .05$ level.

Table 2.15. Comparison of Items of Trust and Norms of Reciprocity Using ANOVA ($N=142$)

Items	Non-CBRM ^a	CBRM ^a	F	p	η^2
People always try to help each other	1.65	1.78	4.99	.03	.034
People help each other in times of need	1.64	1.74	2.69	.10	.019
People mainly look out for themselves ^b	1.22	1.41	6.47	.01	.044
Most people are trustworthy	1.74	1.78	.67	.42	.005
People will take advantage of others ^b	1.58	1.63	.55	.46	.004
Our community is getting less friendly ^b	1.45	1.49	.32	.57	.002

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Items were reverse coded: 0 = Agree, 1 = Neutral, and 2 = Disagree.

Household assets. As illustrated in Table 2.16, we found that possession of six essential items was significantly greater by the members of formal groups as compared to traditional neighborhoods. These included radio (59% versus 62% of CBRMs), car (20% versus 28% respectively), refrigerator (12% versus 20%), butter churn (5% versus 10%), windmill (5% versus 9%), and books (26% versus 38%).

Table 2.16. Comparison of Items for Assets Owned by Member Households of Informal ($n=314$) versus Formal ($n=392$) Pastoral Groups

Sources of information	% non-CBRM ^a	% CBRM ^a	χ^2	p	ϕ
Mobile phone	92	94	1.81	.28	.04
Radio	59	62	.72	.04	.03
Television	84	89	2.93	.09	.06
Motorcycle	82	77	2.41	.12	-.06
Car	20	28	6.48	.01	.10*
Truck or tractor	27	28	.22	.64	.02
Cart: cattle, horse or camel	32	31	.05	.82	-.01
Refrigerator	12	20	9.25	<.01	.12*
Butter churn	5	10	5.63	.02	.09*
Electricity generator (portable)	17	23	3.6	.06	.07
Windmill	5	9	4.46	.04	.08*
Solar panel	91	87	2.61	.11	-.06
Electric lights	69	67	.25	.62	-.02
Books	26	38	11.53	<.01	.13*
Computer	5	9	2.51	.11	.06

Note. Cell entries show positive responses.

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups.

*Indicates the statistical significance at $p < .05$ level.

The effect sizes of these differences were minimal ranging between .03 and .13. We also learned that the majority of households from both group types have mobile phone (92% of non-CBRMs and 94% of CBRMs), TV (84% and 89% respectively), motorcycle (82% and 77%) and solar panel (91% and 87%).

Overall, formal organization increased all intermediate outcomes in three non-desert ecological zones. Specifically, the effects of organization status on cooperation, rules and information diversity had large practical significance. Formal organization was equally influential for four ultimate social outcomes across all ecological zones: proactiveness of members, innovative and traditional rangeland management practices and household assets. Among these the former three had large to medium practical significance. The effect of organization status on social capital was weak. Finally, organization status did not influence levels of cash income and livestock number.

In the following section, we will report effects of ecological zone on both types of social outcomes.

2.4.3. Effect of ecological zone.

2.4.3.1. Effect of ecological zone on intermediate social outcomes.

We found a significant effect of ecological zone on three intermediate outcomes: rules ($F=8.38$, $p<.01$), cooperation ($F=3.19$, $p<.05$) and income diversity ($F=8.81$, $p<.01$) as shown in Table 2.17. Herders from the mountain forest steppe zone had significantly more rules as compared to those in the desert steppe ($\bar{X}_{mount}=.54$ versus $\bar{X}_{desert}=.21$, $p<.01$). Herders in the eastern steppe had significantly more income sources than the steppe zone herders ($\bar{X}_{east}=3.4$ versus $\bar{X}_{steppe}=2.7$ $p<.01$). Herders from the mountain forest steppe cooperated significantly more ($\bar{X}_{mount}=14.73$, $p=.03$) than those in the desert steppe ($\bar{X}_{desert}=11.85$) and the steppe ($\bar{X}_{steppe}=11.52$). We found large effect sizes¹¹ for the differences in rules and income diversity (.16 and .17 respectively, both large).

We examined items of these three intermediate outcomes to define where exact differences between ecological zones occur.

Income diversity. Table 2.18 revealed that the herders from the eastern steppe had significantly more income sources because higher percentage of them reported on six categories. They had incomes from herding others' livestock (17%), government allowances (100%), salaries (19%), rent (2%), family and friends (13%), and pension (40%). However, practical significance of these differences was minimal ranging from .11 to .17. It was interesting that significantly higher percent of desert steppe herders (14%) reported having incomes from mining.

Table 2.17. Results of Two-way ANOVA-1 Showing Main Effect of Ecological Zone on Intermediate Outcome Variables (N=142)

Variable name	Desert steppe <i>n</i> =47	Steppe <i>n</i> =31	Eastern steppe <i>n</i> =11	Mountain forest <i>n</i> =53	<i>F</i>	<i>p</i> -value	partial η^{2k}
Rules ^a	.21 ^g	.53	.53	.54 ^g	8.38	<.01	.16
Knowledge exchange ^b	.68	.58	.49	.54	2.16	.10	.05
Leadership ^c	1.19	1.22	.97	1.08	2.43	.07	.05
Income diversity ^d	2.85	2.65 ^h	3.41 ^h	2.66	8.81	<.01	.17
Information diversity ^e	7.53	8.11	7.59	7.54	.95	.42	.02
Cooperation ^f	11.85 ⁱ	11.52 ⁱ	15.91	14.73 ^{ij}	3.19	.03	.07

Note. ANOVA-1 tested $Y_{1-6} = X_1 + X_2 + X_1 * X_2$ where X_1 is “organization status”, and X_2 is “ecological zones”, and Y_{1-6} included rules, knowledge exchange, leadership, income diversity, information diversity and cooperation. The test revealed a statistically significant interaction effect of organization status and ecological zones on rules and cooperation shown in Figure 2.4.

^a Rules is aggregated from household data and coded as 0 = No Rules, 1 = Traditional or Informal Rules and 2 = Formal Agreed Rules. ^b Knowledge exchange is aggregated from household data and coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3+ people). ^c Leadership is aggregated from household data and coded as 0 = Disagree, 1 = Neutral and 2 = Agree. ^d Income diversity is aggregated from household data summing 17 income sources. ^e Information diversity is aggregated from household data summing 16 information sources. ^f Cooperation is sum of 39 cooperation activities at organization level. ^k Partial eta-squared is the proportion of the total variability attributable to a given factor (Karabi, 2012). The effect size is small if $\eta^2 < .50$, medium if $\eta^2 < .80$, and large if $\eta^2 > .80$.

^{abcd} Means in the same row that share the same superscripts differ at $p < .01$ in the Games-Howell multiple comparison test.

Table 2.18. Comparison of Income Sources of Member Households by Group Ecological Zone (N=706)

Sources of income	Desert steppe n=234	Steppe n=155	Eastern steppe n=53	Mountain forest n=264	χ^2	ϕ
Livestock	100	97	100	99	4.55	.08
Pension	34	32	40	24	8.83**	.11**
Herding others' livestock	4	2	17	5	19.50***	.17***
Government allowances	96	99	100	100	15.11***	.15***
Vegetable farming	3	1	8	5	7.09*	.10*
Salary	4	12	19	8	16.03***	.15***
Remittances	2	1	6	1	5.38	.09
Wage labor	4	4	4	3	.72	.03
Rent	0	0	2	0	12.34***	.13***
Mining	14	0	0	2	53.08***	.27***
Loan interest	0	0	0	1	3.36	.07
Handicrafts	6	6	2	3	4.55	.08
Hunting	0	0	0	2	4.19	.08
Aid from development organization	1	1	2	2	.42	.02
Small business	4	3	6	5	1.39	.04
Family and friends	7	4	13	3	10.06**	.12**
Other income source	6	3	17	5	15.09***	.15***

Note. Cell entries show the percent of positive responses.

*, ** and *** indicate the statistical significance at $p < .10$, $.05$ and $.01$ level

Presence of rules. As shown in Table 2.19, significantly higher percent of groups in the mountain forest steppe reported having informal rules for livestock number (31%, $p < .10$), and formal rules for type of livestock (8%, $p < .10$) and use of hay areas (20%, $p < .01$). Significantly fewer of them (67%, $p < .01$) checked the option of “no rule” for livestock number as compared to herders in other ecological zones. Practical significance of the differences of the mountain forest ecological zone ranged from small to medium (.22 to .32). We also note that more groups from the steppe zone reported having informal rules for livestock type (26%, $p < .01$) and formal rules for livestock number (13%, $p < .05$). We know from the results of organization effect tests that there were fewer rules in the desert steppe. Table 2.19 showed that nearly all groups from this zone reported having no rules for livestock type (100%, $p < .01$) and number (94%, $p < .01$), hay areas (96%, $p < .01$) and almost no formal rules in all regulation areas. About a half of them had informal rules for grazing timing (53%, $p < .10$). Interestingly, more groups in the eastern

steppe did not have rules in most resource regulation areas except informal rules for hay areas (73%, $p < .01$).

Table 2.19. Comparison of Presence of Rules Items by Ecological Zone Using Chi-square Test ($N=142$)

Perceived rule type	Ecological zone	Desert steppe ($n=47$)	Steppe ($n=31$)	Eastern steppe ($n=11$)	Mountain forest steppe ($n=53$)	ϕ
No rule	Timing of grazing	45	29	27	25	
	Number of livestock	94***	77***	100 ^a ***	67***	.32***
	Types of livestock	100***	74***	91 ^b ***	92***	.33***
	Use of hay areas	96***	68***	9 ^c ***	53***	.53***
	Use of wells	67	58	36	60	
Informal rule	Timing of grazing	53*	29*	64 ^d *	38*	
	Number of livestock	6***	10***	0 ^e ***	31***	.22*
	Types of livestock	0***	26***	9 ^f ***	0***	.33***
	Use of hay areas	4***	29***	73 ^g ***	28***	.43***
	Use of wells	28	29***	64	32	
Formal rule	Timing of grazing	2***	42***	9 ^h ***	38***	
	Number of livestock	0***	13**	0 ⁱ **	2**	.41***
	Types of livestock	0***	0*	0 ^j *	8*	.27**
	Use of hay areas	0***	3***	18 ^k ***	20***	.22*
	Use of wells	4	13	0	8	

Note. Cell entries show the percent of members who checked this option (within an ecological zone).

*, ** and *** indicate the statistical significance at $p < .10$, $.05$ and $.01$ levels

Figure 2.5 illustrated that more groups reported having informal rules than formal rules for rangeland management areas. It is apparent that most groups lack rules for type and number of livestock, use of hay areas and wells.

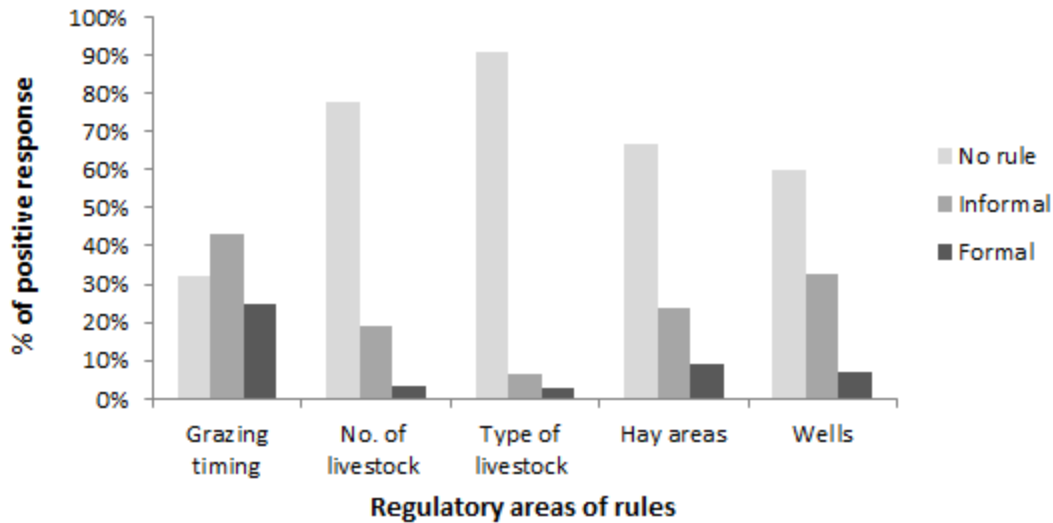


Figure 2.5. Percentage of positive responses on the presence of rules regulating five areas of rangeland management among 142 pastoral groups

Cooperation. Groups in the eastern steppe had significantly more cooperation because higher percentage of them reported in four traditional and three innovative categories than the groups in other ecological zones. Specifically, Table 2.20 shows their reports on harvesting hay together (91%, $p < .01$), restoring and maintaining a spring (100%, $p < .01$) and wells (82%, $p < .01$) and setting aside dzud reserves (46%, $p < .05$). In terms of innovative cooperation (refer to Table 2.21), the eastern steppe groups cooperated more on building fences for protection of spring or streams (91%, $p < .01$), making decisions on wildlife use (27%, $p < .01$), and sharing their equipment (91%, $p < .05$). Among these significant differences, several had medium to large effect sizes including harvesting hay (.51 or large), restoring springs and wells (.41 and .36 respectively, both medium), building fences for streams (.45 or medium) and deciding use of wildlife (.34 or medium).

We highlight that groups in the mountain forest steppe reported increased cooperation as compared to desert steppe and steppe groups. For instance, significantly more of them prepared hand fodder together (31%, $p < .05$) and cooperated on protection of dzud reserves (47%, $p < .05$) as shown in Table 2.20. According to Table 2.21, mountain forest groups had significantly more innovative

cooperation on deciding use of plant resources (33%, $p < .01$), planting fodder or hay (31%, $p < .01$), monitored pasture use (48%, $p < .01$), sanctioning those misusing pastures (26%, $p < .05$), making rules for other resource (92%, $p < .05$) and building fences for protection of pasture and hay areas (39%, $p < .05$).

The lack of the effect of formal organization on cooperation in the desert steppe zone was shown in all items of cooperation except felt making. Remarkably, higher percent of the desert steppe groups cooperated on felt making (48%, $p < .05$) than those in other ecological zones.

Table 2.20. Percentage of Positive Responses on Traditional Cooperation by Groups' Ecological Zone (N=142)

Ecological zone	Desert steppe <i>n</i> =47	Steppe <i>n</i> =31	Eastern steppe <i>n</i> =11	Mountain forest <i>n</i> =53	χ^2	ϕ
Traditional Cooperation						
Manage pastures together	38	65	55	60	6.65*	.22*
Set aside and protect winter/spring pastures	54	48	73	65	3.51	.16
Set aside and protect dzud ^a reserve pastures	20	26	46	47	9.44**	.26**
Manage well use among members	45	48	46	41	.46	.06
Repair or maintain a well or wells together	76	58	82	37	17.87***	.36***
Restore or maintain a spring together	35	29	100	62	23.39***	.41***
Make regular seasonal movements	53	45	55	54	.70	.07
Make otor ^b movements in emergencies	59	42	55	39	4.41	.18
Repair and maintain shelters and corrals	66	61	82	62	1.82	.11
Harvest hay together	20	29	91	69	36.79***	.51***
Prepare hand fodder together	24	7	9	31	7.99**	.24**
Shear sheep and comb cashmere	67	58	82	56	3.31	.15
Slaughter animals together	60	52	36	52	2.09	.12
Make felt together	48	19	18	24	10.34**	.27**
Lend livestock to each other	34	29	9	37	3.38	.16
Exchange livestock	71	55	70	63	2.10	.13

^a Dzud is a Mongolian term for severe winter condition that causes mass mortality of livestock. ^b Otor refers to long distance movement of herders and livestock for search of better pastures.

*, ** and *** indicate the statistical significance at $p < .10$, $.05$ and $.01$ levels

Table 2.21. Percentage of Positive Responses on Innovative Cooperation by Groups' Ecological Zone (N=142)

Ecological zone	Desert steppe <i>n</i> =47	Steppe <i>n</i> =31	Eastern steppe <i>n</i> =11	Mountain forest <i>n</i> =53	χ^2	ϕ
Innovative Cooperation						
Determined timing of pasture use	22	19	55	42	9.19**	.26**
Determine no. of livestock to be grazed	4	3	18	12	4.45	.18
Determined species or age of livestock	7	3	18	12	3.32	.15
Monitor pasture use	13	36	36	48	14.27***	.32***
Sanction people who misuse pastures	4	7	9	26	11.24**	.29**
Monitor pasture conditions	9	23	9	21	3.97	.17
Determined use of specific water sources	27	26	46	28	1.77	.11
Determined use of other plant resources	2	0	0	33	29.14***	.46***
Determined use of wildlife	0	3	27	4	16.34***	.34***
Made rules about any other resources	0	0	9	12	9.59**	.26**
Built fences to protect pasture, hay areas	20	26	0	39	8.74**	.25**
Planted hay or fodder	4	3	0	31	21.27***	.39***
Built fences to protect springs or streams	24	17	91	54	28.01***	.45***
Marketing or selling animal products	32	19	27	25	1.59	.11
Distribute income from livestock products	2	0	9	12	6.55*	.22*
Sold hay or fodder harvested by the group	0	10	18	6	6.93*	.22*
Distributed income from sale of hay/fodder	0	10	9	4	4.94	.19
Share equipment (e.g. tractor, truck)	39	52	91	43	10.20**	.27**
Lend each other money	70	65	46	60	2.53	.14
Arbitrated disputes among members/users	40	28	11	48	6.25*	.22*
Interacted with soum/aimag government	51	61	80	61	3.01	.15
Interacted with external organizations	46	39	40	40	.44	.06
Interacted with technical professionals	41	39	60	49	2.02	.12

*, ** and *** indicate the statistical significance at $p < .10$, $.05$ and $.01$ levels

2.4.3.2. Effect of ecological zone on ultimate social outcomes.

Ecological zone (refer to Table 2.22) had a significant effect on five out of eight social outcome variables. Households from the eastern steppe zone had more assets ($\bar{X}=7.2$, $F=3.43$) than those from the mountain forest region ($\bar{X}=6.2$) at $p<.05$. Herders from the steppe zone had significantly higher cash income ($\bar{X}=6.8$, $F=5.50$ or 420 USD) compared to herders from the mountain forest ($\bar{X}=6.3$ or 130 USD) at $p<.01$. Pastoralists from the steppe and the desert steppe had greater level of trust and reciprocity ($\bar{X}=1.7$, $F=4.57$) in comparison to herders in the mountain forest ($\bar{X}=1.5$) at $p<.01$. The desert steppe herders had significantly greater level of bonding and bridging networks ($\bar{X}=2.5$, $F=4.35$) than those in the mountain forest steppe ($\bar{X}=2.0$) at $p<.01$. Herders from the eastern steppe reported a higher average of 9 traditional activities as opposed 7 practiced by those in the mountain forest steppe at $p<.01$. Though, these significant differences in five outcomes between ecological zones had minimal effect sizes ranging from .07 to .18.

We found no effect of ecological zone on the levels of per capita livestock number ($F=1.36$, $p=.26$), innovative rangeland practices ($F=1.15$, $p=.33$) and proactiveness of members ($F=1.80$, $p=.15$).

In the following subsections, we will report results of items of the four ultimate social outcome variables that had the significant effect of ecological zone. As we did before, we ordered the description of items' results starting from the variable with the largest statistical power for its difference.

Table.2.22. Results of Two-way ANOVA-2 Showing Main Effect of Ecological Zone on Social Outcome Variables

Ecological zone	Desert steppe	Steppe	Eastern steppe	Mountain forest	<i>F</i>	<i>p-value</i>	partial η^2
Variable name	<i>n</i> =47	<i>n</i> =31	<i>n</i> =11	<i>n</i> =53			
<i>Livelihood</i>							
Assets ^a	6.62	6.58	7.24 _a	6.20 _a	3.43	.02	.07
Cash income ^b	6.40 _b	6.79 _{bc}	6.62	6.33 _c	5.50	<.01	.11
Livestock number ^c	4.50	4.72	4.78	4.71	1.36	.26	.03
<i>Social capital</i>							
Cognitive ^d	1.66 _d	1.68 _e	1.59	1.49 _{de}	4.57	<.01	.09
Structural ^e	2.45 _f	2.19	1.90	1.95 _f	4.35	<.01	.09
<i>Behavior</i>							
Traditional practice ^f	8.24 _g	8.52 _h	9.14 _i	7.17 _{ghi}	9.92	<.01	.18
Innovative practice ^g	3.12	2.71	3.71	3.15	1.15	.33	.03
Proactiveness ^h	1.65	1.34	1.41	1.39	1.80	.15	.04

Note. ANOVA-2 tested $Y_{1-8} = X_1 + X_2 + X_1 * X_2$ where X_1 is "organization status", and X_2 is "ecological zones", and Y_{1-8} included assets, cash income, per capita livestock number, cognitive and structural social capital, traditional and innovative practices and proactiveness.

^a Assets is aggregated from household data and sum 15 household items. ^b Cash income per capita is household level log transformed and winsorized variable trimmed 3% of the distribution at each end and replaced those values with -1,195 and 2,283, the next valid values at each side of the distribution to address extreme outliers (Vaske, 2008 p.562). ^c Livestock number per capita is household level log transformed and semi-winsorized variable trimmed the upper 3% of the distribution and replaced those values with 555, the next valid value in the distribution to address extreme outliers (*ibid*). ^d Cognitive social capital is aggregated from household data and reverse coded as 0 (*agree*), 1 (*neutral*) and 2 (*disagree*). ^e Structural social capital is aggregated from household data and sum of 13 bonding bridging items. ^f Traditional practice is aggregated from household data and sum of 14 traditional rangeland management activities. ^g Innovative practice is aggregated from household data and sum of 21 innovative activities. ^h Proactiveness is aggregated from household data and sum of four proactive behaviors.

a,b, c,d,e,f,g,h,i Pairs of means in the same row that share subscripts differ at $p < .05$ in the Games-Howell multiple comparison test.

Traditional practices. Table 2.23 revealed the reasons why more groups in the eastern steppe reported about traditional rangeland practices. More of them harvested hay (94%, $p<.01$), treated livestock for external parasites (74%, $p<.01$) and dewormed animals (94%, $p<.05$) than the herders in other ecological zones. The difference in cutting hay had a larger practical significance (.30 or typical).

Table 2.23. Percentage of Positive Responses on Items of Traditional Practices by Member Households by Ecological Zone (N=706)

Rangeland management practices	Desert steppe <i>n</i> =234	Steppe <i>n</i> =155	Eastern steppe <i>n</i> =53	Mountain forest <i>n</i> =264	χ^2	ϕ
Reserve winter pasture	54	52	64	49	6.74	.10
Reserve spring pasture	48	45	51	39	6.42	.10
Reserve dzud ^a pasture	27	27	40	28	9.88	.12
Do fall (or summer) otor ^b	55	37	49	22	60.25***	.29***
Do winter otor ^b	19	14	28	22	6.83	.10
Cull unproductive animals	64	67	68	56	8.15	.11
Cut hay	59	62	94	83	63.46***	.30***
Prepare hand fodder	45	56	19	34	36.30***	.23***
Purchase and store grain	76	88	81	69	22.75***	.18***
Purchase and store concentrate	50	35	19	33	29.17***	.20***
Purchase other feed	21	30	19	19	10.64*	.12*
Vaccinate livestock	87	93	94	88	5.87	.09
Deworm livestock	83	92	94	89	14.46**	.14**
Treat livestock for parasites	46	72	74	60	33.81***	.22***
Dig a new well	18	14	53	12	57.57***	.29***
Repair existing well	71	70	68	16	193.79***	.52***

^a Dzud is a Mongolian term for severe winter condition that causes mass mortality of livestock. ^b Otor refers to long distance movement of herders and livestock for search of better pastures.

*, ** and *** indicate the statistical significance at $p<.10$, .05 and .01 levels

Table 2.23 also showed that the significantly fewer herders from the mountain forest steppe repaired wells (16%, $p<.01$), did fall or summer otor (22%, $p<.01$), purchased and stored grain (69%, $p<.01$) and other feed (19%, $p<.10$) than herders in other ecological zones. The differences in repairing wells had the larger practical significance (.52 or large) compared to other differences.

Cognitive social capital. As shown in Table 2.24, marginally more of desert steppe herders reported about local people being helpful to each other ($\bar{X}=1.78$, $F=2.98$, $p<.05$) and disagreed with the statement of local people being selfish ($\bar{X}=1.43$, $F=5.50$, $p<.01$). It is also worth noting that significantly more of

steppe herders felt people being helpful in times of need ($\bar{X}=1.79$, $F=4.38$, $p<.01$), and disagreed with the statements of people taking advantage of others ($\bar{X}=1.75$, $F=5.56$, $p<.01$) and getting less friendly ($\bar{X}=1.58$, $F=3.26$, $p<.05$).

Table 2.24. Comparison of Items of Trust and Norms of Reciprocity by Ecological Zone Using One-way ANOVA ($N=706$)

Items	Desert steppe $n=234$	Steppe $n=155$	Eastern steppe $n=53$	Mountain forest $n=264$	F	η^2
People always try to help each other	1.78 _b	1.77	1.72	1.63 _b	2.98**	.01
People help each other in times of need	1.75 _c	1.79 _d	1.68	1.59 _{cd}	4.38***	.02
People mainly look out for themselves ^a	1.43 _e	1.42 _f	1.32	1.16 _{ef}	5.50***	.02
Most people are trustworthy	1.81	1.78	1.66	1.73	1.55	.01
People will take advantage of others ^a	1.64	1.75 _g	1.66	1.48 _g	5.56***	.02
Our community is getting less friendly ^a	1.52	1.58 _h	1.49	1.36 _h	3.26**	.01

^a Items were reverse coded as 0 (*agree*), 1 (*neutral*) and 2 (*disagree*).

_{b-h} Means in the same row that share subscripts differ statistically in the Games-Howell multiple comparison test.

Interestingly, Table 2.24 also demonstrated weakened trust and norms of reciprocity among the mountain forest herders. Significantly fewer of them felt that people being helpful to each other ($\bar{X}=1.63$) and even times of need ($\bar{X}=1.59$), and disagreed with the statements of people mainly look out for themselves ($\bar{X}=1.16$), taking advantage of others ($\bar{X}=1.48$) and getting less friendly ($\bar{X}=1.36$). However, all the differences in items of cognitive social capital had a small practical significance ranging between .01-.02.

Structural social capital. Higher percentage of the desert steppe herders, as shown in Table 2.25, reported receiving assistance from their families in soum (55%, $p<.01$), friends (50%, $p<.01$) and neighbors (77%, $p<.01$). Besides these bonding network, significantly more of them had support from bridging relationships such as government (64%, $p<.01$), an insurance company (12%, $p<.01$), a development aid agency (38%, $p<.01$), a non-governmental organization (15%, $p<.01$), a bank (20%, $p<.01$) and politicians (38%, $p<.01$).

Table 2.25. Percentage of Positive Responses on Structural Social Capital Items by Member Households by Groups Ecological Zone (N=706)

Items of structural social capital	Desert steppe n=234	Steppe n=155	Eastern steppe n=53	Mountain forest n=164	χ^2	ϕ
<i>Bonding social capital:</i>						
Help from neighbors	77	57	56	60	18.72***	.19***
Help from family in soum ^a	55	40	51	35	40.58***	.24***
Help from family in aimag ^b center or the capital Ulaanbaatar	32	33	36	24	42.65***	.25***
Help from distant relatives	14	16	11	12	40.73***	.24***
Help from friends	50	37	42	30	40.99***	.24***
<i>Bridging social capital:</i>						
Help from government	64	50	32	30	73.36***	.32***
Help from politicians	38	32	18	34	6.39*	.11*
Help from religious leaders	8	4	5	5	2.17	.07
Help from CBRM organization	22	17	26	16	37.84***	.23***
Help from development or aid organization	38	23	25	14	54.14***	.28***
Help from non-governmental organization	15	8	2	6	46.20***	.26***
Help from banks	20	13	13	13	38.25***	.23***
Help from insurance companies	12	1	0	2	68.20***	.31***

^aSoum is a rural district in Mongolia below a province. ^bAimag is the largest administrative unit equivalent of a province.

*, ** and *** indicate the statistical significance at $p < .10$, $.05$ and $.01$ levels

Table 2.25 also showed that significantly fewer herders in the mountain forest steppe had supports from both bonding and bridging networks compared to herders in other ecological zones. For instance, only 24% of them reported having help from families in aimag center, 30% from friends, 35% from families in soum at $p < .01$. In terms of bridging relationships, a third of the mountain forest herders had assistance from government, only 2% had help from an insurance company, 14% - from development aid agency, and 16% - from CBRM organization at $p < .01$. Among the differences in structural social capital, we found larger practical significance in help from government and insurance company (.32 and .31 respectively, both typical) compared to other differences with small effect sizes.

Household assets. Table 2.26 demonstrated why groups in the eastern steppe had significantly more assets as compared to groups in other ecological zones. Significantly more of them reported having butter churn (42%, $p<.01$), animal cart (55%, $p<.01$), windmill (19%, $p<.01$) and books (59%, $p<.01$).

Table 2.26. Percentage of Positive Responses on Items of Assets by Member Households by Group Ecological Zone ($N=706$)

Sources of information	Desert steppe $n=234$	Steppe $n=155$	Eastern steppe $n=53$	Mountain forest $n=264$	χ^2	ϕ
Mobile phone	94	97	100	90	12.53***	.13***
Radio	78	72	45	41	82.37***	.34***
Television	84	90	89	87	2.71	.06
Motorcycle	89	84	64	70	38.15***	.23***
Car	32	16	21	22	14.60***	.14***
Truck or tractor	23	37	34	25	11.11**	.13**
Cart: cattle, horse or camel	20	11	55	49	95.22***	.37***
Refrigerator	14	14	26	18	6.43*	.10*
Butter churn	3	2	42	8	104.47***	.39***
Electricity generator	29	23	17	12	24.72***	.19***
Windmill	10	5	19	3	24.52***	.19***
Solar panel	86	92	93	89	4.06	.08
Electric lights	61	75	57	72	13.68***	.14***
Books	33	34	59	27	20.10***	.17***
Computer	6	8	11	7	2.58	.06

*, ** and *** indicate the statistical significance at $p<.10$, $.05$ and $.01$ levels

Table 2.26 also revealed the reasons for significantly less assets possessed by the groups in the mountain forest steppe. Fewer of them reported having radio (41%, $p<.01$), electricity generator (12%, $p<.01$), windmill (3%, $p<.01$) and books (27%, $p<.01$).

In summary, the effect ecological zone on both types of social outcomes was unidirectional. Among the intermediate outcomes, ecological zone positively influenced income diversity and cooperation of groups in the eastern steppe and rules in the mountain forest steppe groups. In contrast, ecological zone was unfavorable for rules and cooperation of groups in the desert steppe. Regarding ultimate social outcomes, ecological zone was favorable for traditional rangeland management practices and assets of the eastern steppe herders, social capital among those in the desert steppe, and cash income and cognitive social capital of the steppe herders. However, ecological zone negatively

influenced the levels of traditional rangeland practices, cash income, assets and social capital of herders in the mountain forest steppe.

Ecological zone did not influence three intermediate outcomes including information diversity, leadership and knowledge exchange. It also had no effect on three ultimate social outcomes: livestock number, innovative rangeland practices and proactiveness of group members.

2.5. Discussion

Our study confirmed the increased social outcomes of CBNRM (Agrawal & Chhatre, 2006; Measham & Lumbasi, 2013; Thompson, 2013) in the Mongolian context (Fernandez-Gimenez et al., 2014; Leisher et al., 2012; Schmidt, 2006; Usukh et al., 2010). It showed that the formal organization of rangeland resource users strongly encouraged proactive behavior in addressing local resource issues and increased management practices in both traditional and innovative forms. The formal organization also led to a moderate increase in groups' social capital (Upton, 2008; Wagner & Fernandez-Gimenez, 2008) by enhancing their bridging networking with other stakeholders in rangeland management.

Our results demonstrated a strong influence of resource system characteristics on social outcomes of pastoral groups, in line with the institutional theories on the commons (Agrawal, 2001; Ostrom, 1990; Wade, 1988). The positive effect of formal organization on several ultimate social outcomes was further fostered by ecological zone. More traditional rangeland practices and assets were found in the eastern steppe while social capital was higher in the desert steppe. Similarly, cash income and trust and norms of reciprocity among the members were greater in the steppe. However, the mountain forest zone had a negative effect on several measures, but this does not mean that outcomes were reduced. Rather it implies that the level of social outcomes achieved in this ecological zone was lower than those in other zones. These results point to the unknown to us specifics of resource systems that either support or impede the effect of formal organization.

On the other hand, the study did not confirm optimistic livelihood outcomes of CBNRM shown in prior studies (Leisher et al., 2012; Usukh et al., 2010) measured as members' net cash income and their livestock holding. However, we found an increase in assets possessed by member households. Our interpretation of these results will be elaborated in subsection 2.5.3.

It is worth noting the finding of the important role of the intermediate outcomes in achieving CBRM ultimate social outcomes. It confirmed prevailing conceptual arguments about the essential capacity building elements of CBRM (Brooks et al., 2013; Measham, 2007). This result also demonstrated the adequacy of our typology of social outcomes and the applicability of these variables for measuring social outcomes in the pastoral context. On the other hand, the study showed the ineffectiveness of the current approach for facilitating rules and cooperation in the desert steppe ecological zone, supporting the findings of Usukh et al. (2010). Instead, a strategy, which considers essentials of the desert ecosystem and strong existing social capital among desert pastoralists, may work better.

In the following sub-sections, we will provide more in-depth discussions of the study results.

2.5.1. CBRM and non-CBRM groups are structurally homogenous.

Within the scope of this study, we found a little variability between the two types of the groups in group attributes such as members' education, sex, age and well-being status (Upton, 2008) and their housing. In other words, these characteristics did not show associations with groups' social outcomes. Nonetheless, the effect of significantly larger group size and management areas of PUGs supported by SDC can be examined as part of a comparative study among the formal groups. Such study can define more effective institutional design for the CBRM groups in Mongolia.

We note that 30% of CBRM member households were poor and very poor (refer to Table 2.4) including female-headed households and those with no livestock at all. This proportion is close to the national poverty rate of over one third of the population since 1995 (NSO, 2011; NSO and World Bank,

2001). This may indicate rather inclusive approach of CBRM in the study areas (Fernandez-Gimenez et al., 2014).

2.5.2. CBRM increases intermediate outcomes of pastoral groups.

We hypothesized that the level of intermediate outcomes would be greater in formally organized groups and our results support this hypothesis in all ecological zones except the desert steppe. However, differences in income diversity between the two group types were small.

The information advantage of members of the formal groups was associated with attending CBRM meetings, participating in training within and outside of their soum, and learning from technical experts, all brought by the donor projects. Such benefits became available thanks to their formal organization and commitment for sustainably managing their resources, which enabled groups' cooperation with external organizations, professionals and government officials. This was also a reason why informal groups lacked these opportunities¹¹. In addition, CBRM members had greater access to various informational handbooks, brochures, and newspapers supplied by the projects (Schmidt et al., 2009; SDC, 2011; UNDP, 2008). Our findings revealed a perceived lack of knowledgeable and respected local leaders, which supports findings of other studies (Murphy, 2014; Upton, 2008).

As theorized, formal organization facilitated cooperation among their members. Cooperation increased in three strategic areas of rangeland management. First, households increased pasture coordination for setting aside and protecting winter and spring grazing areas, fencing key pastures and hay fields, and managing use of water sources (UNDP, 2008; Usukh et al., 2010). Their cooperation advanced for managing risks by setting aside dzud reserves, preparing hand fodder collectively and making otor movements in emergencies (Fernandez-Gimenez et al., 2012). Lastly, using members'

¹¹ Skills training curricula at aimag and district level employment facilitation institutions have contents mostly designed for urban jobs such as hairdresser, baker, cook, plumber, beautician, etc. (Ministry of Labor and Social Welfare of Mongolia, 2012) In addition, according to our estimation, an average distance from CBRM groups to these training institutions in aimag centers was 107 km.

traditional knowledge and recently obtained new skills, the members started cooperating on new tasks such as monitoring condition and use of pastures, and sanctioning those misusing resources and arbitrating disputes among the herders. These types of cooperation and coordination among members form major roles of rangeland management institutions in the pastoral context.

On the other hand, the regulatory function of pastoral institutions was shown to be fairly weak. Important areas of rangeland management such as adjusting the number and types of livestock, managing use of wells and hay areas remain unregulated or are largely under “traditional use” claims (Upton, 2012). Although formal regulation was emerging, particularly for regulating and coordinating the timing of grazing (Figure 2.5), formal rules remain rare. This may indicate complexity of the ongoing process of reviving proven traditional norms as well as adapting to the new free market system. It is challenging for the current generation of pastoral groups mostly brought up by socialist collectives with top-down administration. These dynamics accompanied by uncertainties of natural and legal aspects (Fernandez-Gimenez & Batbuyan, 2004) of pastoral rangeland management in Mongolia further complicate the development of CBRM institutions.

2.5.3. CBRM increases desired rangeland management practices, proactive behavior and essential assets.

Our hypothesis about ultimate social outcomes was partially supported. Formal organization increased proactive behaviors such as approaching authorities about resource management issues and joining community actions. It helped reviving traditional practices and introducing adaptive innovations, and moderately increased social capital of the groups.

CBRM did not improve livelihood measures in per capita livestock number and cash income. Achieving these goals depend on multiple factors, some of which may be beyond CBRM potentials. Livestock number in Mongolia is strongly controlled by abiotic factors going through the “boom and

bust” cycles (Behnke et al., 1993). Best efforts of CBRM pastoralists to overcome natural hazards by utilizing adaptable strategies did not succeed in saving livestock due to grazing pressures by incoming herders from other districts (Fernández-Giménez et al., 2012). Paradoxically, strong norms of reciprocity negatively affected the CBRM outcome in the absence of cross-scale coordination of otor movements (ibid). Institutions capable of such coordination have to be at an inter-soum or inter-aimag level, which is above CBRM groups. The second livelihood indicator, cash income of herder households, is, in turn, very much dependent on livestock number when profit per animal tends to be constant. According to a study of UNDP and SDC (2007), over the half of income of households with less than 300 SFU came from milk. Those families having over 300 units received the same percentage of income from meat. Our data showed that an average share of cashmere in household income was 31 % (refer to Figure 2.6).

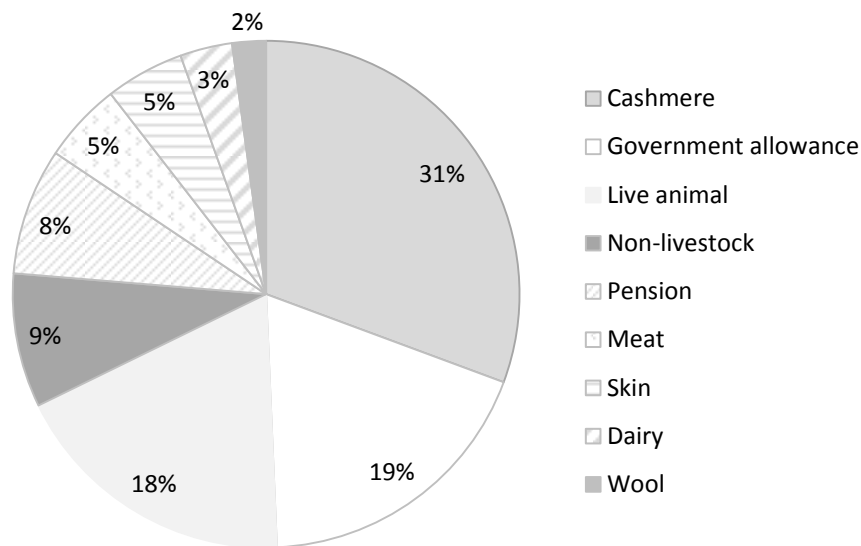


Figure 2.6. Income structure of an average herder household in Mongolia (N= 706)

In 2009, World Bank reported that about 69% of all herder households of Mongolia had less than 200 SFU. Clearly, sale of live animals and cashmere are dominant income sources for the majority

of herder families. Considering the limitations of sale of live animals as a regular income source, cashmere remains the most commercially valuable commodity for many pastoralists. Hence, potentials of CBRM to influence cashmere market are limited. Instead, fostering alternative income generation opportunities and increasing risk management may contribute to long-term livelihood benefits. In turn, achieving livelihood improvement is challenging in the absence of reliable market access and relevant skills for production processes. We note that 90% of CBRM groups were, on average, in their third year of formal operation at the time of our study. While increasing livestock numbers and cash incomes of herders requires favorable external environment including improved ecological conditions and market factors that all take time to come to fruition. Therefore, a conclusive statement about livelihood results here might be premature. Instead, we highlight that behavioral outcomes can be achieved earlier than social capital and livelihood improvements that require more time and cooperative interactions of multiple actors.

Similarly, a weak difference in social capital between CBRM and non-CBRM herders contradicted results of other studies (Hess et al., 2010; Upton, 2008). Closer examination showed that CBRM members had greater bridging social networks than traditional neighborhoods. Such higher level of social network was more strongly associated with available support from their CBRM organization.

2.5.4. Resource characteristics influence social outcomes of pastoral communities.

As hypothesized, the desert steppe had modest levels of rules and cooperation compared to other zones. Lower density of herding households due to lower productivity in the desert steppe and less frequent interactions may restrict members' cooperation and make setting rules unnecessary. Conversely, with their already high social capital, the level of cooperation based on informal norms could be sufficiently high to make formal rules redundant or counterproductive.

We found that households in the eastern steppe had more diversified income sources. Eastern steppe communities applied grazing rules to a greater extent than other regions. These differences may have led to the greater use of traditional practices and to the accumulation of hard assets in these communities. Mountain forest steppe communities had higher levels of cooperation and agreed rules, but their social outcomes in terms of use of traditional practices, and trust and norms of reciprocity, were lowest among the ecological zones. Similarly, mountain forest steppe communities had the smallest cash income and assets. This result did not support our hypothesis about lower livelihood outcomes in the desert steppe. Nevertheless, these results point to a need for a follow-up qualitative inquiry to explain such differences. They also show that considerations of specifics of ecological zones need to be intrinsic part of CBRM policy and planning.

2.5.5. Other findings relevant to the development of CBRM in Mongolia.

Along with the results of differences between the two types of groups, there were several other findings worth noting. Overall, Mongolian herders rely considerably on local information sources such as soum and bag meetings, local government officials, and their khot ail¹⁶ members and neighbors. From non-local sources, television (90%) and radio (70%) were most popular media. Hence, these sources have more potential for information dissemination and education among pastoralists.

For both group types, bonding social capital remains a critical resource for dealing with daily tasks and household level risks. The report of CBRM organization as an only helpful organization available in a soum shows dominant self-reliance of the groups and their limited access to other sources for assistance.

Although CBRM groups demonstrated greater intermediate outcomes, their mean values were far below the highest cases reported by some formal groups. This shows that there are ample rooms to improve CBRM performance. Further improvement may require more investment and participation of

other actors such as the national government and civil society organizations rather than external donors alone.

2.6. Implications and Conclusions

This study pointed to a need for CBRM development in Mongolia beyond the efforts of a few donors in the form of “policy experiments” (Usukh et al., 2010) or the creation of “model” community groups to convince the government of CBRM potentials (UNDP 2007). Despite contradictory reports about CBRM success elsewhere (Addison et al., 2013; Murphy, 2011; Upton, 2008), this paper provides evidence for optimism about community-based management arrangements in Mongolia. It emphasizes the process-oriented nature of institutional development, where some outcomes can be achieved smoothly in time and across space while others like livelihood improvement require more complex evolution. In the Mongolian context, where CBRM has been catalyzed and supported by external facilitation, intermediate outcomes were achieved relatively soon. Among the ultimate social outcomes, those outcomes at individual household levels such as proactive behaviors and the increase in rangeland practices were also achieved early on. Social capital outcomes that go beyond the individual level and involve community interactions and cooperation both horizontally and vertically, showed some promising signs. However, livelihood outcomes that require more investments, favorable external environment and time to achieve, have yet to come to fruition. Indeed, some successful CBNRM cases in Africa have taken over two decades of consistent work (NACSO, 2008). Thus, we caution against interpreting the lack of measurable livelihood outcomes of CBRM as an indicator of failure or low performance. Rather, these indicators may require more time to develop and must build upon a strong foundation of intermediate social outcomes, for which we do have evidence.

The current process of formal organization of herder groups in Mongolia has been restricted by available resources of external agencies, and thus has had a limited local effect. All the intermediate

outcomes facilitated by the projects were benefited by a small percentage of local resource users¹² proactive enough to respond to the call for collective action. Since the existing government system does not enable these intermediate outcomes (as shown by the cases of traditional neighborhoods), ultimate social outcomes of the majority of non-CBRM groups remain stagnant. In the absence of the necessary acknowledgement from the central government, local public administration remains passive in maintaining the effect of technical assistance projects despite their significant roles in local rangeland management (Leisher et al., 2012; Upton, 2012). To sustain and replicate results demonstrated by formal groups facilitated by external agencies, the government needs to formally recognize CBRM, its role in rangeland management (Ostrom et al., 1994).

CBRM policy should encourage self-organization of pastoral groups rather than external initiation of formal organization. A study of Gobi CBRM groups reported that there were many self-initiated nukhurluls following examples of the project initiated groups in neighboring areas (Undargaa et al., 2007). For such initiatives, strong legal and economic incentives are needed. Only in this way can CBRM involve more pastoral groups. The government education and employment facilitation system has to integrate the goal for CBRM development but in a more pastoral-oriented fashion as modeled by external agencies. These essentially include herder-tailored training content and service availability at their immediate areas in suitable timing for herders. Simultaneously, the policy should attract other potential actors to bring more investments in production of intermediate outcomes for self-initiated pastoral groups. Such bottom-up process with necessary external facilitation should encourage revival of traditional institutions for rangeland management. This process will enable adaptive innovations by the pastoralists while carefully considering local resource characteristics in their ecological regions.

The promising case of CBRM in Mongolia may encourage mobile pastoral communities elsewhere to cooperate on sustainable management of their resources. However, as the study showed,

¹² Schmidt et al. (2009) reported that their project covered about 20% of total soum herder households. UNDP project involved 10-15% of herding population of their target soums (Baival, 2012).

mindful facilitation for achieving intermediate outcomes while accounting for the specifics of the local resource systems will be the necessary prerequisite for achieving increased social outcomes.

CHAPTER THREE: UNDERLYING MECHANISMS EXPLAINING IMPROVED SOCIAL OUTCOMES OF MONGOLIAN PASTORAL COMMUNITY GROUPS

Summary

Community-based rangeland management (CBRM) has been proposed to be a promising option for dealing with rural poverty and resource degradation in Mongolia. However, with conflicting results documented domestically as well as globally, its reputation has been questioned. Yet little is known about the factors that influence CBRM success or lack thereof. Using data from 142 pastoral communities, we explored underlying mechanisms for social outcomes of Mongolian CBRM. We examined if the effect of formal organization on groups' social outcomes was mediated by information diversity, leadership, knowledge exchange, and agreed rules using a serial-multiple mediation model. Mediation effect is defined as an effect of a third variable on an already established relationship between two variables. The study revealed a mediation effect of these variables on the relationship between the formal organization and traditional and innovative rangeland practices, proactive behavior and social networks of pastoralists. Among these interdependent mutually-enforcing mediators, information diversity had a triggering effect on other three mediating variables. This ordered chain of information diversity→leadership→knowledge exchange→rules collectively increased the effect of formal organization on the above four social outcomes. We also found that the mediated effect of organization status on members' proactive behavior and their social networking had a moderation effect of or dependent on ecological zone.

3.1. Introduction

Since the late 1990s, rural Mongolia has been facing two major problems: poverty, unknown to Mongolians for several decades prior to the democratic and free-market transition of 1992 (NSO and

World Bank, 2001; World Bank, 1996) and resource mismanagement (Crisp et al., 2003; Fernandez-Gimenez, 2001). Both have been blamed for the deterioration of country's natural resource base. The issues have been further exacerbated by ongoing climate change documented by scientists (Batima, 2006; Dagvadorj et al., 2010; Nandintsetseg & Shinoda, 2013) and observed by herders (Bruegger et al., 2014; Marin, 2010). Several external development organizations saw community-based natural resource management (CBNRM) to be a potential option to address these problems (Agriteam-Canada, 1997; Swift, 1995). Projects of the German Technical Cooperation (GTZ)¹³ and United Nations Development Program (UNDP)¹⁴ first introduced the community-based natural resource management model to Mongolia (Ministry of Nature and Environment, 2007; Schmidt, 2006). The process of engaging herder communities in natural resource management has been further expanded by other external donors, initially as aid to address the consequences of the 1999-2001 *dzud* (severe winter weather disaster). These efforts have gradually led to institution-building objectives for rangeland management substantially weakened by the transitional reforms following decollectivization and livestock privatization. According to a UNDP (2006) herder group assessment, in 2006 there were 14 different programs facilitating capacity building of over 2000 herder groups in 19 aimags (provinces).

Prior studies of CBNRM in Mongolia showed mixed outcomes as has been the case internationally (Agrawal & Chhatre, 2006; Measham & Lumbasi, 2013; Nadasdy, 2003; Saito-Jensen et al., 2010). Some studies found positive outcomes of CBRM in Mongolia (Baival, 2012; Leisher et al., 2012; Upton, 2008), while others documented ineffectiveness (Addison et al., 2013; Murphy, 2011) or called for cautious positivism (Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012). Despite valuable contributions, these studies were limited by small samples and restricted geographic coverage

¹³ GTZ-funded "Conservation and Sustainable Management of Natural Resources in Mongolia" programs was implemented from 1998 to 2006 (Schmidt et al., 2009).

¹⁴ UNDP Mongolia started community forestry project following 1997 forest fire in Mongolia (South, 2015). Later in 2002 UNDP-funded "Sustainable Grassland Management Project" commenced in 12 soums of three provinces (UNDP, 2008).

that reduced the representativeness of the findings. In contrast, the present study used data from 142 pastoral groups across four ecological zones in 10 of Mongolia's 21 aimags. Our work builds on a prior study about whether community-based rangeland management (CBRM) increases social outcomes of pastoral groups in Mongolia (Chapter 2). This study found that CBRM members used more traditional and innovative practices and exhibited greater proactive behavior to solve rangeland issues compared to non-CBRM members. CBRM members also owned more household assets, had slightly higher levels of trust, stronger norms of reciprocity and larger social networks. However, formal CBRM organizations did not differ from non-CBRM groups in livelihood measures such as annual cash income and livestock per capita. Formal organization was associated with greater intermediate outcomes, including better access to information, leadership, knowledge exchange, cooperation and agreed rules, which are thought to facilitate social outcomes. The study found significantly varied social outcomes of pastoral groups among four ecological zones. These included higher levels of social capital in desert steppe groups, greater cooperation and rules in the mountain forest steppe, and more income sources, assets and use of traditional practices in the eastern steppe.

In this paper, we investigate underlying processes that links formal organization to ultimate social outcomes. We ask how and why different social outcomes occur in two types of nomadic communities in similar social, political and environmental contexts as well as “when” and “for whom” it works (Wu & Zumbo, 2008). To respond to this broad question, we had several sub-questions. First, we ask (1) if a model of eight factors including formal organization, six intermediate variables of access to information, leadership, knowledge exchange, rules, cooperation and income diversity, and group's ecological zone can predict the level of social outcomes of pastoral groups. Second, we explore (2) whether intermediate outcomes facilitate the relationship between the formal organization and ultimate social outcomes. We also investigate associations between the intermediate outcomes: (3) if they facilitate ultimate social outcomes independently of each other (in a parallel fashion) or in a

sequential order. Lastly, we ask (4) whether such mediated relationship between formal organization and ultimate social outcomes is conditioned by the ecological zone of a group. We hypothesized that the organizational status of pastoral groups and their ecological zone together with intermediate outcomes will predict groups' ultimate social outcomes. Second, we expected that intermediate outcomes will have a mediation effect on the relationship between formal organization and ultimate social outcomes. Third, we expected that ecological zone would have a moderation effect on this mediated relationship. Due to the shortage of relevant studies and theories about interconnection between the factors facilitating CBNRM, our analysis of the relationships between proposed mediators is exploratory nature. In the following section, we explain the study's conceptual framework by highlighting theoretical foundations and relevant background of Mongolian pastoral social-ecological systems.

3.2. Conceptual Framework

As shown in our conceptual framework (Figure 3.1), organization status of pastoral groups (formally organized or traditional) and their location in a particular ecological zone influence ultimate social outcomes of the groups. Results of our prior study confirmed the positive relationship (Chapter 2) between the formal organization and ultimate social outcomes but the effect of ecological zone was mixed. In this study, we consider how organization status mediates ultimate social outcomes through multiple intermediate outcomes. Further, we propose that these intermediate outcomes are interconnected, and have a combined effect on ultimate social outcomes. On the basis of the prior results summarized earlier, we also expect that ecological zone moderates the effect of organization status on ultimate social outcomes.

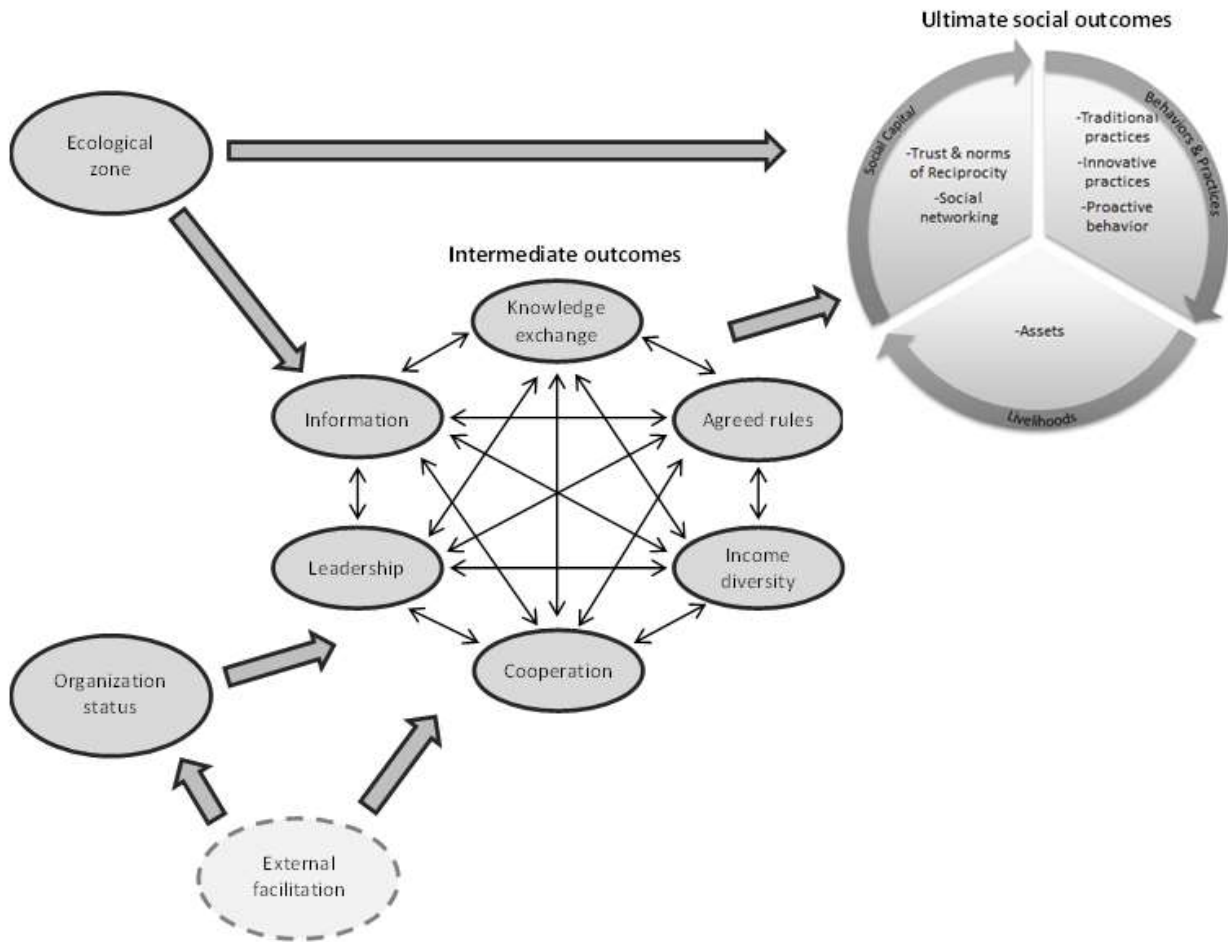


Figure 3.1. Framework depicting the effects of formal organization and ecological zone on three ultimate social outcomes: livelihoods, practices and behavior and social capital. These ultimate outcomes are facilitated by intermediate outcomes such knowledge exchange, agreed rules, income diversity, cooperation, leadership, and information.

Scholarship on the commons proposes that given certain conditions, community-based management of local resources can have positive outcomes. Despite the varying social and ecological settings of CBNRM globally, studies consistently point to the necessity of institutional arrangements or “sets of formal and informal rules and norms that shape interactions of members with others and the nature” (Agrawal & Gibson, 2001, p. 14) in any community context (NRC, 2002, p. 89; Pagdee et al., 2006). Specifically, well-functioning rules that regulate member behavior by limiting individual

maximizing behavior in favor of actions for the collective benefit have been key for successful, long-enduring resource institutions (Agrawal, 2002; Baland & Platteau, 1996; Ostrom, 1990). Such regulations limit free riding problems and punish those violating collective agreements (Agrawal & Gibson, 1999). Traditional norms shared by local resource users often promote conservation by prohibiting certain harmful behaviors, and for community-based management, the presence of such customary norms encourages cooperation on more formal arrangements to manage common resources (Agrawal & Gibson, 2001). In most situations, self-organized groups initially rely on locally-evolved norms of reciprocity, trust, and local leaders before developing formal agreements among members. Formal agreement involves regulations of more complex interactions such as restricting the amount, timing, or place of resource use, and sharing costs and benefits (Ostrom, 2000). As the collaborative process advances towards a more developed form, groups continue developing their rules to reflect various situations to be regulated, improving rules' content and making them more formal. CPR theory tends to emphasize the importance of formal rules over informal norms in governing common pool resources. Formal rules should be "devised and modified over time" (Ostrom, 1990, p. 89) by group members according to their specific circumstances and collective choice.

Organization status in the conceptual framework contains these two forms of resource institutions: informal groups or traditional neighborhoods relying on customary norms, and formal groups bound by bylaws and resource use agreements. In Mongolia, contextual factors (Agrawal, 2001) or external facilitation played a triggering role in the formation of formal groups. To reflect this origin, external facilitation was included in the framework as variable that influences organization status and resulting intermediate outcomes. However, external facilitation will not be analyzed in this chapter and is thus shown in a faded color. In chapter 2, we found that formal organization status positively affected

all intermediate outcomes and six ultimate social outcomes¹⁵. In this study, we examine the mechanisms underlying the relationship between organization status and ultimate social outcomes. Specifically, our purpose is to test the mediation effect of intermediate outcomes and the moderation effect of ecological zone. Theoretically, a mediator “links a cause and an effect” and is statistically correlated with the mediated variables (Wu & Zumbo, 2008, p. 368). A variable mediated has precedence to the mediator. In our case, the formal organization preceded intermediate variables. In contrast, a moderator “modifies a causal effect” (p. 368) and “explains its strength and direction” (p. 379). The moderator has precedence and is uncorrelated with those moderated. These were the features of the proposed moderator variable i.e. ecological zone. The mediation model answers questions “how” and “why” while the moderation model addresses questions “for whom” and “when” (ibid). We hypothesized that the effect of the organization status on ultimate social outcomes will be mediated by the intermediate outcomes. Further, this indirect effect may be conditioned by ecological zone.

Ecological zone was included on the basis of the consistent theoretical argument that resource characteristics strongly influence management outcomes of commons institutions (Agrawal, 2001; Ostrom, 1990; Wade, 1988). Studies on Mongolian rangelands have found that desert steppe regions are dominated by non-equilibrium dynamics, with highly variable resource productivity controlled by rainfall variation and timing rather than livestock grazing (Fernández-Giménez, 1997; Okayasu et al., 2012; Wesche et al., 2010; Zemmrich, 2007). These scarce and uncertain resource attributes have shaped Mongolia’s main pastoral strategies including high mobility, flexibility, diversification, storage and pooling (Brown et al., 2013; Fernandez-Gimenez et al., 2014). Depending on distinctive climatic and geophysical attributes, Mongolia has been divided into various ecological zones (Douglas et al., 2006). Such zoning considers amount and timing of precipitation, temperature extremes, elevation, frost-free

¹⁵ Originally, we had eight ultimate social outcomes including cash income and livestock number in addition to six shown here. We found no significant effect of organization status on these two variables, hence, excluded them from this study.

days, soil type and vegetation characteristics (Simukov, 1934; Tsegmid & Vorobyov, 1990). Our study sites were located in four ecological zones including the desert steppe, steppe, eastern steppe and mountain and forest steppe. Prior results showed that desert steppe pastoralists had greater social capital while those in the eastern steppe had more assets and used more traditional rangeland management practices compared to groups in other zones (Chapter 2). The groups in the mountain and forest steppe had more rules while members of eastern steppe groups had higher income diversity. We also found an interaction effect of organization status and ecological zone on cooperation and the presence of rules among the desert steppe groups. Hence, we hypothesized that ecological zone will moderate the mediated relationship between the organization status and ultimate social outcomes. Due to the mixed effect of ecological zone on social outcomes, we had no expectations about the direction of the moderation effect.

3.2.1. Ultimate social outcomes.

We selected three sets of dependent social outcome variables (Figure 3.1). Most evaluations of CBNRM consider livelihood outcomes and changes in resource conditions as key measures of CBNRM success (Conley & Moote, 2003; Hibbard & Lurie, 2012; Plummer & Armitage, 2007). However, following our research objectives, we focused on social outcomes related to social and economic well-being of Mongolian pastoralists rather than rangeland conditions. Consequently, we conceptualized that livelihood, social capital and rangeland management practices and behavior present the ultimate social outcomes of CBRM institutions in Mongolia.

For Mongolian pastoralists, access to technology and equipment is important to household production (Murphy, 2014; Sneath, 1999). Essential assets such as vehicles, tractors, cell-phones and TV increase production capacity and herders' access to information, which is critical in vast sparsely populated areas. Possession of these assets, a viable number of livestock, and cash income determine

the capability of rural herding communities to meet their subsistence needs and address risks under uncertain and variable environmental conditions (Fernandez-Gimenez et al., 2012; Fernandez-Gimenez et al., 2011). Our early study confirmed the positive effect of formal organization on the level of household assets.

Empirical studies suggest that community members engaged in cooperation under agreed rules for managing common resources are more likely to adopt ecologically-friendly practices and behaviors for resource use (Baival et al., 2011; Ostrom & Hess, 2010; Upton, 2008). We considered two existing forms of rangeland practices in Mongolia. Traditional practices include those activities inherited from millennia-long adaptation of the nomads to their lands (Fernandez-Gimenez, 2000), proven strategies for sustainable rangeland management (Fernandez-Gimenez, 2000, 2006). Innovative practices brought by supporting donor agencies, or government include fencing key resource areas, monitoring pasture condition, improved animal breeding, and growing forage plants. All these incorporate technological developments that may be seen as “both a motor and a product of social change” (Sneath, 1999, p. 223). Additionally, individual members’ proactiveness on issues related to resource management is important in group collective action. Our prior findings showed that the formal organization significantly increased traditional and innovative rangeland management practices and proactive behaviors of group members.

Theoretical models of commons institutions emphasize that social capital variables such as trust, norms of reciprocity and social networks of members in resource institutions strongly influence the levels of both livelihoods and resource conditions (Ostrom, 1998). These three dimensions of social capital (Putnam, 1993) interact with each other and facilitate social outcomes through collective action and democratic governance (Titeca & Vervisch, 2008) while reducing transaction costs of collective action (Ostrom, 1990). We adopted Uphoff et al.’s (2000) concept of cognitive and structural social capital and measured both types among the group members. Trust and norms of reciprocity together with other social values were defined as cognitive social capital specific to the local (micro) individual

level (Grootaert, 2002) “resulting from mental processes”. Social networks are referred to as structural social capital (Uphoff et al., 2000, p. 4). Structural social capital was further subcategorized as bonding (horizontal network of like-minded individuals with similar social status) and bridging (ties with actors from different social or cultural backgrounds) social capital (Putnam, 2000, p. 22). For pastoralists, strong bonding and bridging social capital present essential risk management strategies important for overcoming both household-level risks and community-wide covariate hazards such as dzud (severe winter weather) and droughts (Fernandez-Gimenez et al., 2012; Swift, 1995). Our prior results confirmed stronger social capital among members of formal groups compared to informal groups.

3.2.2. Intermediate social outcomes.

Intermediate outcomes included six variables: access to information, local leadership, opportunity for knowledge exchange, cooperation, income diversification, and the presence of rules to constrain resource use. Studies assessing success of CBNRM argue that these intermediate variables play an important role in ultimate achievements of CBNRM (Measham & Lumbasi, 2013; NACSO, 2008; USAID, 2009). However, empirical studies to test this causal model are rare.

Ostrom (1990) showed that the ability to obtain and exchange credible information is an important factor for collective actions of local users. The same applies to Mongolian pastoral groups. In post-socialist Mongolia, abrupt economic reforms resulted in limited access to information and lack of training, skills, and government services contributed to rural vulnerability (Marin, 2008; UNDP, 2011). With the demise of state-sponsored institutions in early 1990s, Mongolian herders lost their regular access to mail and newspaper delivery, local libraries, cultural clubs and mobile cinema¹⁶, that had played a significant role in their daily activities and education as a population scattered across large geographic areas with limited transportation and communication (Rossabi, 2005; Sneath, 1999).

¹⁶ In 1987 Mongolia had 455 cultural clubs, 498 mobile cinema projectors, and 404 libraries with at least one per each collective which were 255 at the time (Academy of Science, 1990).

Under the new market condition, pastoralists faced a need for selling their products and purchasing necessities on their own while managing daily livestock herding tasks and responding to highly uncertain environments (Swift, 1995). In addition, herders lacked forums for discussion to share their issues and exchange ideas that would help them network with each other to handle these tasks. These problems have been targeted by many externally-funded CBNRM programs (Ostrom & Hess, 2010; Upton, 2008; Usukh et al., 2010), which initiated information delivery and local forums in remote rural communities.

During the collective era, the state cooperatives provided leadership in rangeland management including allocation of pasture, coordination and support for of seasonal movements, emergency assistance, training and education, marketing and social services (Fernandez-Gimenez, 2001; Rossabi, 2005). Most collective leaders were either experienced herders or professionals in livestock husbandry who had a strong knowledge of traditional practices and specifics of the local ecological conditions. Thus many customary forms of organization and resource use were reflected in cooperative management (Swift, 1995). A few recent studies reported deteriorating trust in local formal leaders and wealthier community members who had rather individualistic strategies under the new market setting (Murphy, 2014; Upton, 2008).

Traditionally, Mongolian pastoralists regularly cooperated at different levels of rangeland institutions. At the neighborhood level, cooperation included coordinating use of pastures, hay areas, water sources, and salt licks, as well as labor sharing for nomadic movements, clearing pastures from snow, or searching for lost animals (Mearns, 1996b). Some authors noted revival of such traditional cooperation following decollectivization, which was weakened during the state cooperative times (Mearns, 1996a) but others contested the presence of such cooperation (Bruun, 2006). Recent assessments reported some forms of new cooperation encouraged by technical assistance projects (Upton, 2008; Usukh et al., 2010) such as fencing key resource areas for protection, monitoring pasture

condition, and planting vegetables. Results of our prior studies were in line with these theories and empirical studies (Chapter 2). We note that the effect of organization status was weak on income diversity. This study emphasized the relationships among the intermediate variables. We explored if a sequence is present among the intermediate outcomes. Further, we suggest that the intermediate outcomes have a mediating role for the relationship between the organization status and ultimate social outcomes. Following our prior results, we also argue that ecological zone has a moderation effect on this mediated relationship.

3.3. Method

3.3.1. Sampling design.

Our unit of analysis was local rangeland user groups. Following a methodological guidance of the International Forestry Resources and Institutions (IFRI), a user group was defined as a set of individuals who use and maintain rangelands within a specific geographic location for consumptive or non-consumptive purposes (IFRI, 2013). We sampled 142 community groups in 36 soums¹⁷ from 10 aimags¹⁸ of Mongolia. Geographically, these groups were located across four ecological zones including desert steppe, eastern steppe, steppe and mountain forest steppe.

As shown in Figure 3.2, we paired adjacent soums with donor-supported community-based rangeland management (CBRM) groups and those without them (non-CBRM). The former comprised 54% ($N=77$) of the total sample and the remaining 46% were traditional neighborhood groups ($N=65$). The study used a nested sampling design (Lieberman, 2005) including two different levels of social organization: household and community group. Within each soum, we randomly selected one to nine community groups sharing common resources such as grazing areas and water sources.

¹⁷ Soum is a rural district, the administrative unit below aimag (province).

¹⁸ Aimag is the largest administrative unit in Mongolia equivalent of province.

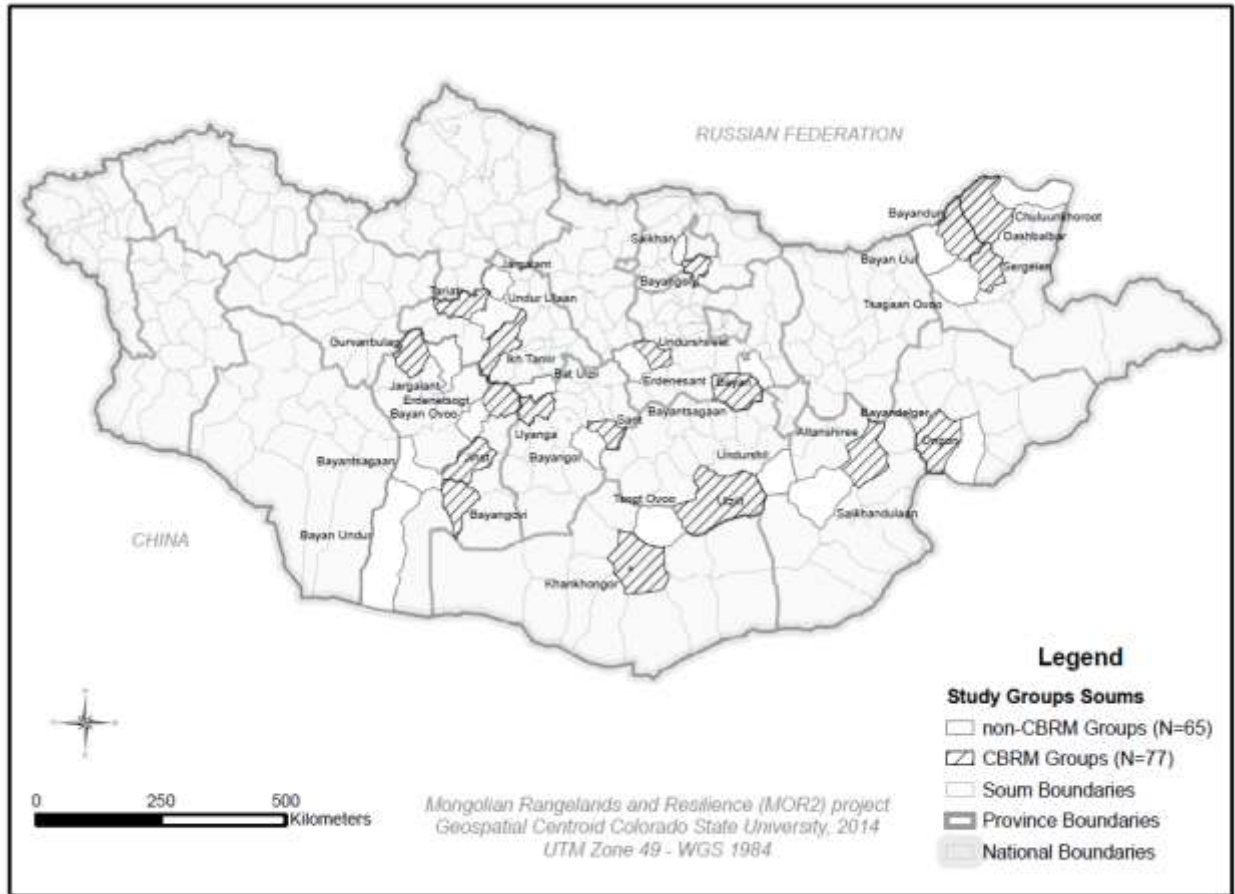


Figure 3.2. The map shows the location of the study soums (N=36) paired with and without community based rangeland management groups.

As some social outcomes needed to be measured at the group member level, we interviewed on average five households within each group. In nine donor-supported¹⁹ soums, we had smaller sampling frames that limited random selection. We interviewed at least five members of those few groups that were present and/or still active in the soum. With this sampling approach, we interviewed a total of 706 households of which 382 (or 54%) were members of formal groups, and 324 (46%) were from traditional informal groups (refer to Figure 3.3). Due to various circumstances¹⁹ the number of sampled households varied from three to seven per community group.

¹⁹ For example, it happened several times that when we approached the area where herder households told to be residing, we did not find them as they moved elsewhere prior to study team’s arrival.

3.3.2. Surveys.

Figure 3.3 summarizes our sampling design and data collection tools at each study level. We designed the research instruments on the basis of prior studies in Mongolia's rangelands (Fernandez-Gimenez, 2001; Fernandez-Gimenez & Batbuyan, 2004; Fernandez-Gimenez et al., 2012) applying IFRI approach (IFRI, 2013). Household interviews were quantitative questionnaires measuring member household's demographics, livelihood, rangeland management practices, norms and behaviors and their social networks. At the group level, we conducted interviews with group leaders and focus groups of the members. Based on information from member household questionnaires, focus groups, and leader interviews, the study team synthesized an organizational profile survey for each community group. This organization survey included group's profile, organizational management, and social relations.

The instruments were originally developed in English and then translated into Mongolian for data collection purposes. Two teams of Mongolian social researchers collected data between April 2011 and June 2012. The collected data were entered into two separate Microsoft Access databases, which were designed in the same format as respective survey instruments. For the data analysis, we transferred the stored data into Statistical Package for the Social Sciences (SPSS 22) software.

3.3.3. Variables.

3.3.3.1. Independent variables.

The independent variables were (a) organization status, (b) ecological zone and (c) six intermediate variables. (a) The organization status was dichotomous with "no formal organization or non-CBRM" and "formal organization or CBRM." (b) Ecological zone was categorical and coded as 1 "desert steppe," 2 "steppe," 3 "eastern steppe," and 4 "mountain forest steppe". (c) Intermediate

outcome variables included six variables: information sources available to the members, perceptions about leadership including community and local government leaders, knowledge exchange within and

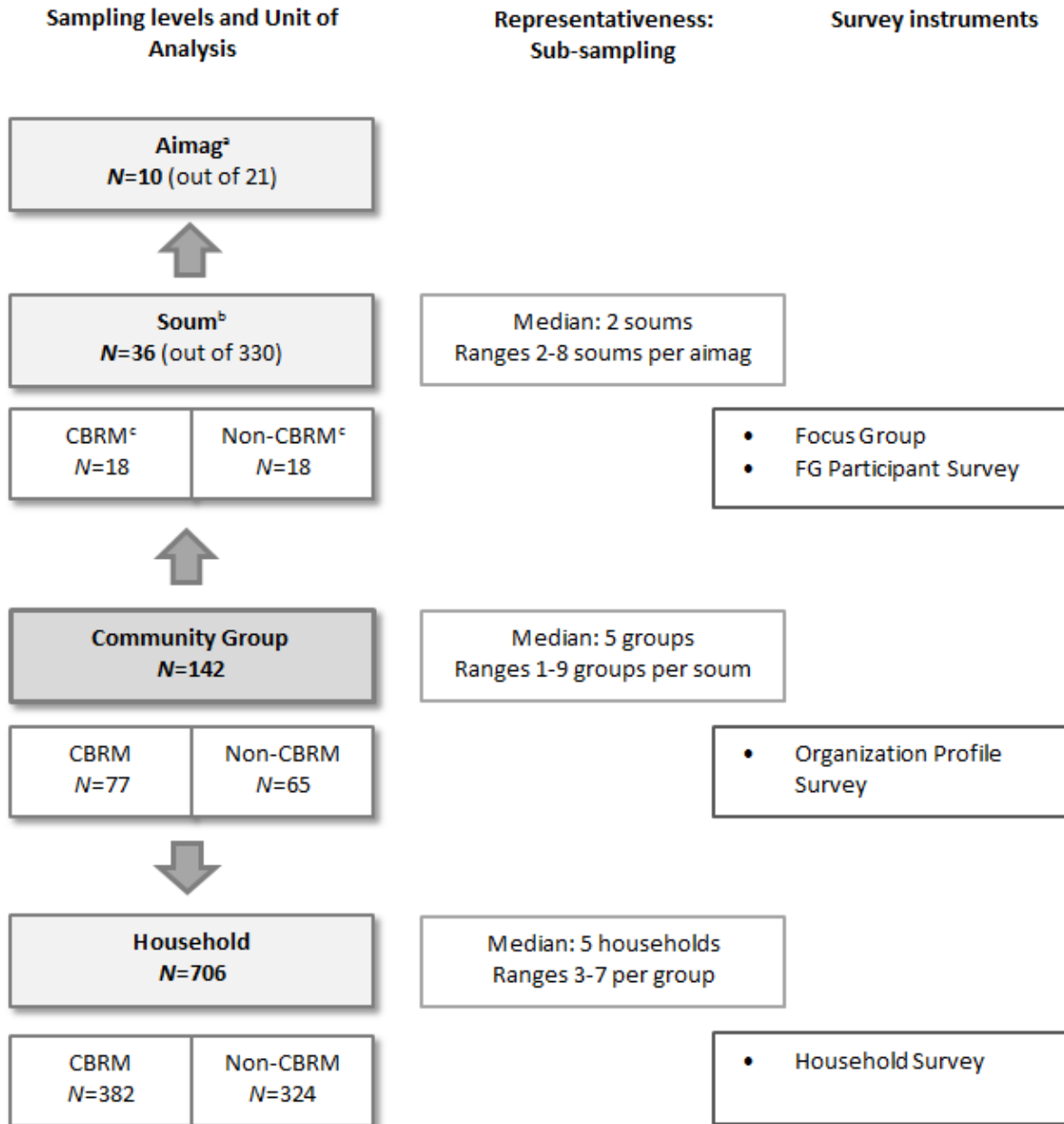


Figure 3.3. Sampling design and size, survey instruments of the comparative study of community groups (N=142) in Mongolia

^a Aimag is the largest administrative unit in Mongolia equivalent of province. ^b Soum is a rural district, the administrative unit below aimag. ^c CBRM stands for Community-based Rangeland Management referring to formally-organized groups. Non-CBRM denotes informal or traditional neighborhoods groups

outside of the group, agreed rules for rangeland management among members, income sources of the member households, and group cooperation. We coded them differently in line with Mongolian rangeland context as shown in Table 3.1.

Table 3.1. Descriptives of Variables Used in the Analysis of Pastoral Groups in Mongolia (N=142)

Variable name	Description	M	SD	Range	Skewness
Independent variables					
Organization status	categorical; non-CBRM ^a vs.CBRM ^a				
Ecological zone	categorical; four ecozone types ^b				
Intermediate outcomes:					
Rules ^c	Mean of 5 types on a scale of 0-2	.43	.43	0-1.4	.93
Cooperation	Sum of 39 cooperation types	13.16	7.09	0-31	.49
Information diversity ^d	Sum of 16 information sources	7.66	1.78	3-13	.30
Knowledge exchange ^{d,e}	Mean of 4 items on a scale of 0-2	.59	.34	0-1.5	.51
Income diversity ^d	Sum of 17 income sources	2.78	.52	1.8-4.0	.58
Leadership ^{d,f}	Mean of 4 items with 0-2 scales	1.14	.36	0-1.9	-.09
Ultimate outcomes:					
Livelihood:					
Assets ^d	Sum of 15 household assets	6.50	1.12	4-9	-.10
Social capital:					
Cognitive social capital ^{d,g}	Mean of 6 items	1.60	.31	.4-2.0	-1.17
Structural social capital ^d	Sum of 13 items	2.16	.82	.5-4.0	.26
Behavior:					
Traditional practices ^d	Sum 16 traditional practices	7.97	1.68	4-13	.06
Innovative practices ^d	Sum of 19 innovative practices	3.09	1.77	0.2-9.0	.93
Proactiveness ^d	Sum of 4 proactive items	1.47	.83	0-4.0	.56

^a CBRM stands for Community-based Rangeland Management refers to formally-organized groups and non-CBRM denotes informal or traditional neighborhoods groups. ^b Ecological zones are coded: 1 = Desert Steppe, 2 =Steppe, 3 = Eastern Steppe, and 4 = Mountain Forest Steppe. ^c Rules is a group level variable coded as 0 = No Rules, 1 = Traditional or Informal Rules. ^d These variables from household survey dataset were aggregated to the organization level by taking the mean value for the sampled households within each organization or neighborhood group. ^e Knowledge exchange items were coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3< people). ^f Leadership items were coded as 0 = Disagree, 1 =Neutral and 2 = Agree. ^g Cognitive social capital items were reverse coded as 0 = Agree, 1 = Neutral and 2 = Disagree.

Three of the intermediate outcome variables were dichotomous and indicated the presence of cooperation, sources of information and income for member household. The remaining three had response scales; knowledge exchange assessed if the members have someone to consult and exchange

ideas on essential topics of rangeland management. Leadership measured the presence of legitimate local leaders. Lastly, agreed rules indicated the presence of rules reported by herders.

3.3.3.2. Dependent variables.

Three main variables comprised dependent ultimate social outcomes: (a) livelihood, (b) social capital and (c) rangeland practices and member's behaviors. (a) We measured livelihood by examining the possession of essential household assets. (b) We had two types of social capital. Cognitive social capital assessed the level of trust and norms of reciprocity among members. Structural social capital indicated the presence of bonding and bridging social ties of the members. (c) Behaviors and practices included reports of traditional and innovative rangeland management practices. We measured proactiveness by investigating members' responses about their actions and initiatives related to local rangeland issues. As noted in Table 3.1, all six ultimate social outcomes were calculated from the household dataset. We aggregated household variables to the organization level by taking the mean value for the sampled households within each organization or neighborhood group.

The response rate was complete for most of the variables ($N=142$). Table 3.1 displayed value ranges of the variables to depict the location of the group mean for a particular variable. To evaluate the normality of data distribution, we examined the skewness where the values between +1.0 and -1.0 were considered acceptable given the robustness of parametric statistical tests (Vaske, 2008, p. 276). We performed reliability tests for the scale variables were to verify the internal consistency of items as shown in Table 3.2.

3.3.4. Analysis.

For examining relationships between the organization status and social outcomes, we took several steps of analyses with four research questions. The details of these steps are described in the following subsections.

3.3.4.1. Testing the model of eight-predictors on ultimate social outcomes.

We tested the regression model of eight explanatory variables to address the research question “does the model influence ultimate social outcomes of pastoral groups?” Since organization status was dichotomous, we used dummy variable multiple regressions (Vaske, 2008). We chose the eight-variable model resulted from the backward selection method (Ott&Lyman, 2010) using the equation (3.1).

$$Y_{1-6} = i_Y + b_1(X_1) + b_2(X_2) + b_3(X_3) + b_4(X_4) + b_5(X_5) + b_6(X_6) + b_7(X_7) + b_8(X_8) + \varepsilon_Y \quad (3.1)$$

3.3.4.2. Testing associations between the intermediate outcomes.

For the path analysis, we excluded two intermediate variables: cooperation and income diversity. The PROCESS statistical software, we chose to use, had restrictions for maximum of four simultaneous mediators. We excluded these variables for two reasons. First, the two variables can be considered as outcomes of other four intermediate variables. Thus, there is less likelihood of these two variables serving as mediators for ultimate social outcomes. Secondly, we explained in the conceptual framework that donors’ facilitation followed a sequential order. Donors provided first essential information to local user groups, fostered their leadership and facilitated knowledge sharing. When local groups were sufficiently informed and motivated to cooperate, they were assisted to set more formalized rules for themselves (Schmidt, 2005). Statistically, these four factors have the required precedence to ultimate social outcomes (Wu & Zumbo, 2008).

Further, we needed to determine the mediation model type: parallel or serial multiple mediators. As the former assumes no causal relationships between the mediators (Hayes, 2013, p. 143), we chose the serial model based on the results of a partial correlation²⁰ test displayed in Table 3.3.

²⁰ Partial correlation is defined by Hayes (2013, p. 74) as “the Pearson correlation between the residuals from a model estimating *Y* from the covariates, and the residuals from a model estimating *X* from the covariates”. He advised examining partial correlation between mediators controlling *X* to define any causal associations between them (p. 144).

Table 3.2. Frequencies and Reliability of Variables and Indices

Indices and variables	<i>N</i> ^a	<i>M</i>	<i>SD</i>	Cronbach's <i>alpha</i> if item deleted	Cronbach's <i>alpha</i> ^f
<i>Knowledge exchange</i>^b:					.82
Livestock health, reproduction, and nutrition	703	.76	.65	.79	
Livestock marketing	702	.58	.69	.78	
Pasture rotation and resting	701	.51	.65	.75	
Disaster preparedness and risk management	701	.49	.64	.76	
<i>Cognitive social capital</i>^c:					.79
People always try to help each other	704	1.72	.64	.76	
People help each other in times of need	702	1.70	.63	.76	
Most people are trustworthy	703	1.76	.53	.76	
People mainly look out for themselves ^d	702	1.32	.83	.74	
People will take advantage of others	702	1.61	.69	.75	
Our community is getting less friendly	704	1.47	.76	.74	
<i>Leadership</i>^c:					.57
My community has good informal leaders	703	1.31	.86	.45	
My community has some knowledgeable and respected people	703	1.45	.84	.45	
I know helpful organizations in my soum	700	.67	.89	.55	
The local government pays attention and listens to us	700	1.09	.85	.54	
<i>Rules</i>^e:					.75
Rules exist to regulate the timing of grazing	142	.92	.75	.72	
Rules exist to regulate the number of livestock	141	.23	.50	.71	
Rules exist to regulate the type of livestock	140	.12	.41	.71	
Rules exist to regulate use of hay areas	139	.42	.66	.68	
Rules exist to regulate use of wells	138	.47	.63	.70	

^a Cell entries show sample sizes from two datasets: household survey (*N*=706) and organization profile survey (*N*=142). ^b Items were coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3+ people). ^c Items were coded as 0 = Disagree, 1 = Neutral and 2 = Agree. ^d Items were reverse coded as 0 = Agree, 1 = Neutral and 2 = Disagree. ^e Items were coded as 0 = No Rules, 1 = Traditional or Informal Rules and 2 = Formal Agreed Rules. ^f Cronbach alpha is a coefficient of reliability showing consistency among items within an index variable, where score greater than .65 is desirable (Vaske, 2008).

Table 3.3. Partial Correlation Matrix of Proposed Mediator Variables Accounting for the Effect of Organization Status

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Presence of rules	.43	.41	1	-	-	-	-	-
2. Cooperation	13.16	7.09	0.36**	1	-	-	-	-
3. Information diversity	7.68	1.77	0.21*	0.25**	1	-	-	-
4. Knowledge exchange	.59	.34	-.17	.07	0.42**	1	-	-
5. Income diversity	2.79	.51	-.07	.03	.08	0.17*	1	-
6. Leadership	1.14	.36	-.14	0.19*	0.46**	0.53**	.13	1

* and ** indicate significant correlation at 0.05 and 0.01 levels respectively.

To define relationships between the four intermediate variables, we conducted multiple regressions controlling organization status and ecological zone. Standardized coefficients were used because of different units and scales of the intermediate variables. As shown in Figure 3.4, we found an interdependence of proposed mediators and created a sequential order based on the strength and magnitude of association as well as conceptual relationships.

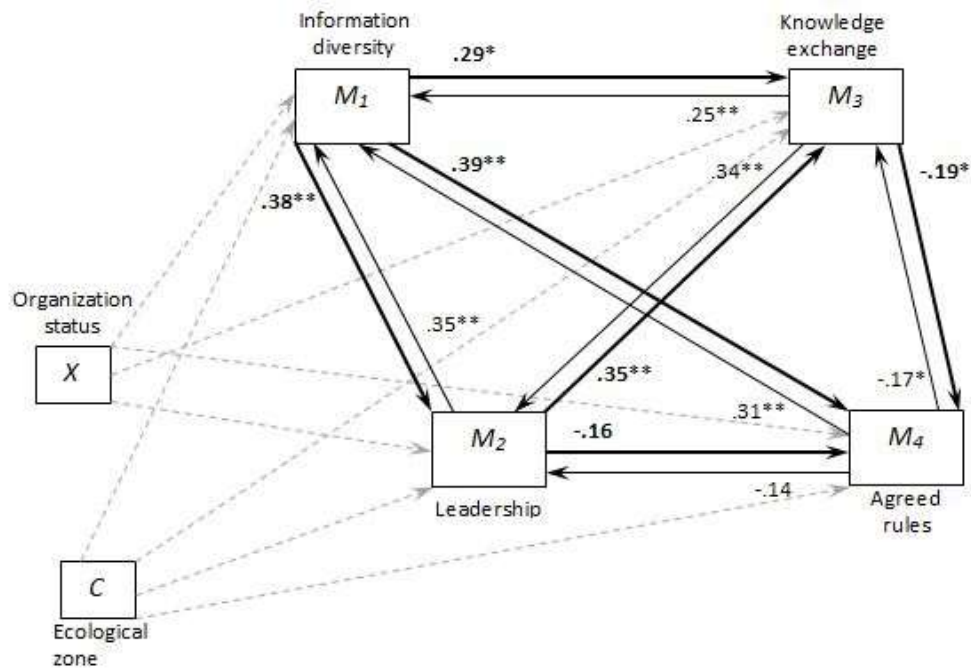


Figure 3.4. Interdependence of four intermediate outcome (mediator) variables accounting effects of organization status and ecological zone (shown by dashed gray arrows): larger effects are shown by solid thicker arrows and smaller ones by thinner arrows. Arrows point to the dependent variable

* and ** standardized coefficient is significant at the 0.05 and 0.01 levels respectively.

3.3.4.3. Testing the mediation effect of intermediate outcomes.

With the serial-multiple mediator model defined, we created a conceptual path model (Figure 3.5.). This figure illustrated a modified version of the conceptual framework in Figure 3.1 with four intermediate variables and placed in an ordered sequence. I excluded ecological zone from the conceptual framework as I tested the variable in the moderation model. The four mediators including information diversity (M_1), leadership (M_2), knowledge exchange (M_3) and agreed rules (M_4) were conceptualized to mediate the effect of organization status (CBRM vs. non-CBRM) on the ultimate social outcomes. We included ecological zone as a potential moderator of the combined effect of mediators and the organization status on social outcomes.

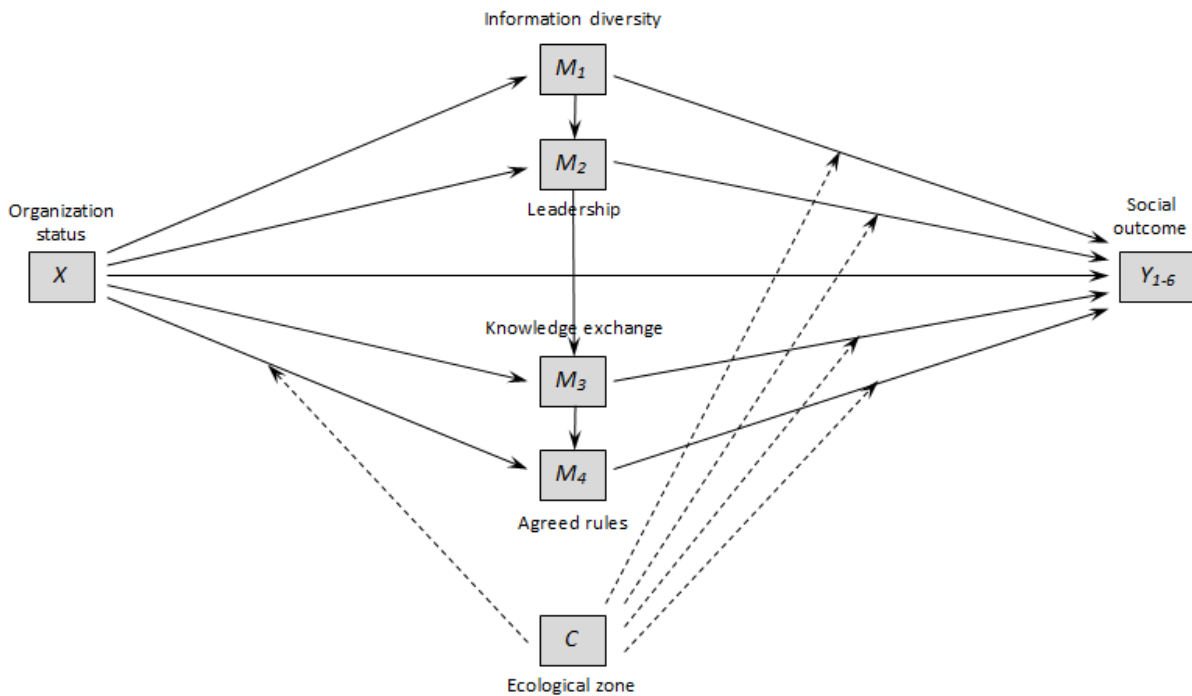


Figure 3.5. A conceptual path diagram shows organization status' influence on ultimate social outcomes through serial multiple mediators: bold lines represent variable's effect on other variables and arrows show the direction of the effect. Ecological zone moderates the combined effect of mediators (M1-4) and organization status (X) on ultimate social outcomes (Y1-6) shown by pecked lines. Our prior study (Chapter 2) showed the moderation effect of ecological zone on the presence of rules depicted in the graph.

Statistically, this method is defined as moderated mediation (Wu & Zumbo, 2008) or conditional indirect effect (Hayes, 2013) of the organization status (X) on social outcomes (Y). This test addressed the second research question “is the effect of organization status on social outcomes mediated by the four serial mediators?”

Figure 3.6 depicts a statistical path diagram of the same analysis where boxes represent our measured variables, and arrows point to predicted variables. Arrows pointing away from variables are the predictors or independent variables. The diagram also shows the direct effect (c') of the organization status (X) on social outcome variables (Y_{1-6}) while holding all the mediator variables constant. Further, the figure illustrates specific indirect effects²¹ of the organization status on the mediators and specific indirect effects of the mediator variables' on social outcomes ($b_1, b_2, b_3,$ and b_4) controlling the effects of the organization status ($a_1, a_2, a_3,$ and a_4). In addition, the diagram shows specific indirect effects of mediators on one another ($d_{21}, d_{31}, d_{32}, d_{41}, d_{42},$ and d_{43}). All the coefficients quantify the effects of predictor variables on their respective criterions.

²¹ The indirect effects in a multiple mediator model are named as specific indirect effects (Hayes, A. 2013. p.128)

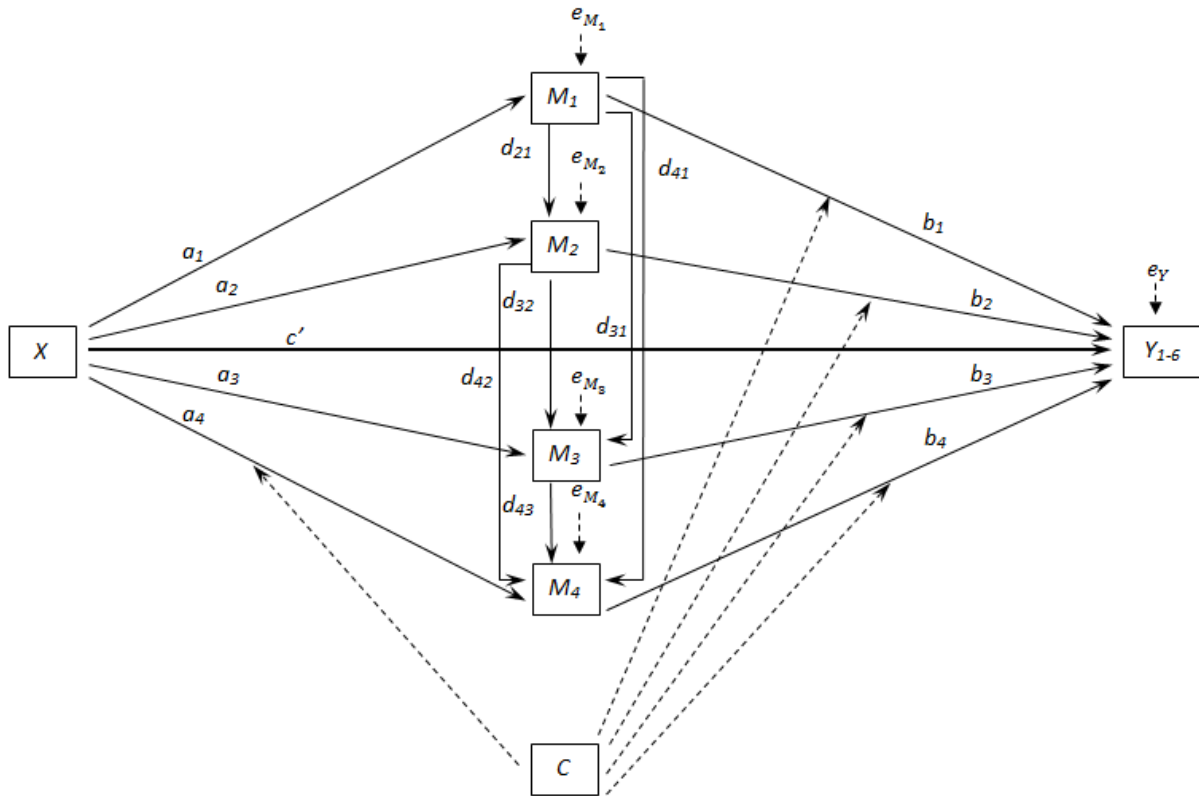


Figure 3.6. A statistical path diagram shows organization status' influence on ultimate social outcomes through serial multiple mediators: bold lines represent variable's effect on other variables and arrows show the direction of the effect. Ecological zone moderates the combined effect of mediators (M_{1-4}) and organization status (X) on ultimate social outcomes (Y_{1-6}) shown by pecked lines. Our prior study showed the moderation effect of ecological zone on the presence of rules depicted in the graph.

c' the direct effect of organization status (X) on ultimate social outcome variables (Y) holding M_{1-4}
 a_1 - a_4 the specific indirect effects of organization status (X) on each of four mediators (M_1 , M_2 , M_3 , and M_4). b_1 - b_4 the specific indirect effects of each mediator on a social outcome variable (Y) holding a_{1-4}
 d_{21} d_{31} d_{32} d_{41} d_{42} and d_{43} the specific indirect effects of each mediator on the subsequent mediator variable

The model had five different pathways by which the organization status is proposed to influence social outcomes of the groups. These pathways are presented by arrows tracing every possible way from the predictor variable (X) to a criterion variable (all six Y s). Based on the statistical diagram, we constructed five multiple regression equations²² as follows:

²² Number of equations necessary is determined as $k+1$ where k is a number of mediators. It also refers as number of pathways X can exert its effect on Y (ibid. p.127)

$$M_1 = i_{M_1} + a_1X + e_{M_1} \quad (3.2)$$

$$M_2 = i_{M_2} + a_2X + d_{21}M_1 + e_{M_2} \quad (3.3)$$

$$M_3 = i_{M_3} + a_3X + d_{32}M_2 + d_{31}M_1 + e_{M_3} \quad (3.4)$$

$$M_4 = i_{M_4} + a_4X + d_{43}M_3 + d_{42}M_2 + d_{41}M_1 + e_{M_4} \quad (3.5)$$

$$Y_{1-6} = i_Y + c'X + b_1M_1 + b_2M_2 + b_3M_3 + b_4M_4 + e_Y \quad (3.6)$$

For the path analysis, we used PROCESS software of Hayes, (2013), which offered higher statistical power while releasing normality assumptions for the sampling distribution of indirect effects (p. 106). This was plausible for our data with unequal subsamples. PROCESS model for serial-multiple mediators tests the indirect effects using bias-corrected bootstrap confidence intervals²³. We used 5,000 bootstrap samples for the hypothesis testing. The PROCESS outputs provided estimates for the total effects, direct effects, and total indirect effects as well as specific indirect effects. The estimations of indirect effects were calculated by multiplying the regression weights corresponding to each step in an indirect pathway. In our analysis, we have a total of 15 indirect effects (*Ind1-15*) of *X* on *Y_s* as follows:

- Ind1* = a_1b_1 - effect through *M₁* (*X* → *Infodiv* → *Y_i*)
- Ind2* = $a_1d_{21}b_2$ - effect through *M₁* and *M₂* (*X* → *Infodiv, Lead* → *Y_i*)
- Ind3* = $a_1d_{31}b_3$ - effect through *M₁* and *M₃* (*X* → *Infodiv, KnowExch* → *Y_i*)
- Ind4* = $a_1d_{41}b_4$ - effect through *M₁* and *M₄* (*X* → *Infodiv, Rules* → *Y_i*)
- Ind5* = $a_1d_{21}d_{32}b_3$ - effect through *M₁*, *M₂* and *M₃* (*X* → *Infodiv, Lead, KnowExch* → *Y_i*)
- Ind6* = $a_1d_{21}d_{42}b_4$ - effect through *M₁*, *M₂* and *M₄* (*X* → *Infodiv, Lead, Rules* → *Y_i*)
- Ind7* = $a_1d_{31}d_{43}b_4$ - effect through *M₁*, *M₃* and *M₄* (*X* → *Infodiv, KnowExch, Rules* → *Y_i*)
- Ind8* = $a_1d_{21}d_{32}d_{43}b_4$ - effect through *M₁*, *M₂*, *M₃* and *M₄* (*X* → *Infodiv, Lead, KnowExch, Rules* → *Y_i*)
- Ind9* = a_2b_2 - effect through *M₂* (*X* → *Lead* → *Y_i*)

²³ In bias-corrected bootstrap confidence intervals, “the endpoints are adjusted as a function of the proportion of *k* values (bootstrap estimates) of *ab** (indirect effect of *X* on *Y* through *M*) that are less than *ab*, the point estimate of the indirect effect calculated in the original data. The adjustments are based on the skew of the distribution *k* bootstrap estimates” (Hayes, 2013, p. 111)

- $Ind10 = a_2d_{32}b_3$ - effect through M_2 and M_3 ($X \rightarrow Lead, KnowExch \rightarrow Y_i$)
- $Ind11 = a_2d_{42}b_4$ - effect through M_2 and M_4 ($X \rightarrow Lead, Rules \rightarrow Y_i$)
- $Ind12 = a_2d_{32}d_{43}b_4$ - effect through M_2M_3 and M_4 ($X \rightarrow Lead, KnowExch, Rules \rightarrow Y_i$)
- $Ind13 = a_3b_3$ - effect through M_3 ($X \rightarrow KnowExch \rightarrow Y_i$)
- $Ind14 = a_3d_{43}b_4$ - effect through M_3 and M_4 ($X \rightarrow KnowExch, Rules \rightarrow Y_i$)
- $Ind15 = a_4b_4$ - effect through M_4 ($X \rightarrow Rules \rightarrow Y_i$)

PROCESS also provided outputs for statistical tests for contrasts between all specific indirect effects, which we used for the analyses. Total effect of X on Y was calculated using the following formula:

$$c = c' + a_1b_1 + a_1d_{21}b_2 + a_1d_{31}b_3 + a_1d_{41}b_4 + a_1d_{21}d_{32}b_3 + a_1d_{21}d_{42}b_4 + a_1d_{31}d_{43}b_4 + a_1d_{21}d_{32}d_{43}b_4 + a_2b_2 + a_2d_{32}b_3 + a_2d_{42}b_4 + a_2d_{32}d_{43}b_4 + a_3b_3 + a_3d_{43}b_4 + a_4b_4 \quad (3.7)$$

where c' is the direct effect of X on Y while holding constant all the mediators. Hence, the total effect is partitioned into the direct effect and the total indirect effect (the sum of all 15 specific indirect effects).

We tested the total effect model of PROCESS, it was tested by regressing a dependent variable on organization status. In our model the regression equation was as follows:

$$c = c' + a_1b_1 + a_2b_2 + a_3b_3 + a_4b_4 \quad (3.8)$$

3.3.4.4. Testing the moderation effect of ecological zone.

To test the moderation effect of ecological zone, we used PROCESS, which allows a formal test of the conditional indirect effect of organization status on social outcomes. We wanted to address the third research question if the indirect (mediated) effect of organization status on ultimate social outcomes was moderated (conditioned) by the location of groups in a particular ecological zone. As the PROCESS serial multiple mediators' model did not have a simultaneous test for moderation, we had to run it separately for those variables with a significant mediation effect. This model treated four mediators as parallel controlling their combined indirect effects on social outcomes. We run the test

four times with each ecological zone as a dummy variable. The moderation test used the following equation:

$$Y_{1-6} = i_Y + c'X + b_1M_1 + b_2M_2 + b_3M_3 + b_4M_4 + b_5V + b_6M_1V + b_7M_2V + b_8M_3V + b_9M_4V + e_Y \quad (3.9)$$

In addition to the interaction effect test, PROCESS provides coefficients for the conditional indirect effect of X on Y through mediators between different values of moderator (e.g. desert steppe=1 versus non-desert steppe=0)(Hayes, 2013, p. 403).

Finally, Figure 3.7 depicts a modified conceptual framework that reflected the established order of four serial mediators transferring the effect of organization status on social outcome variables. It also shows a possibility of such relationships being conditioned by ecological zone of the groups.

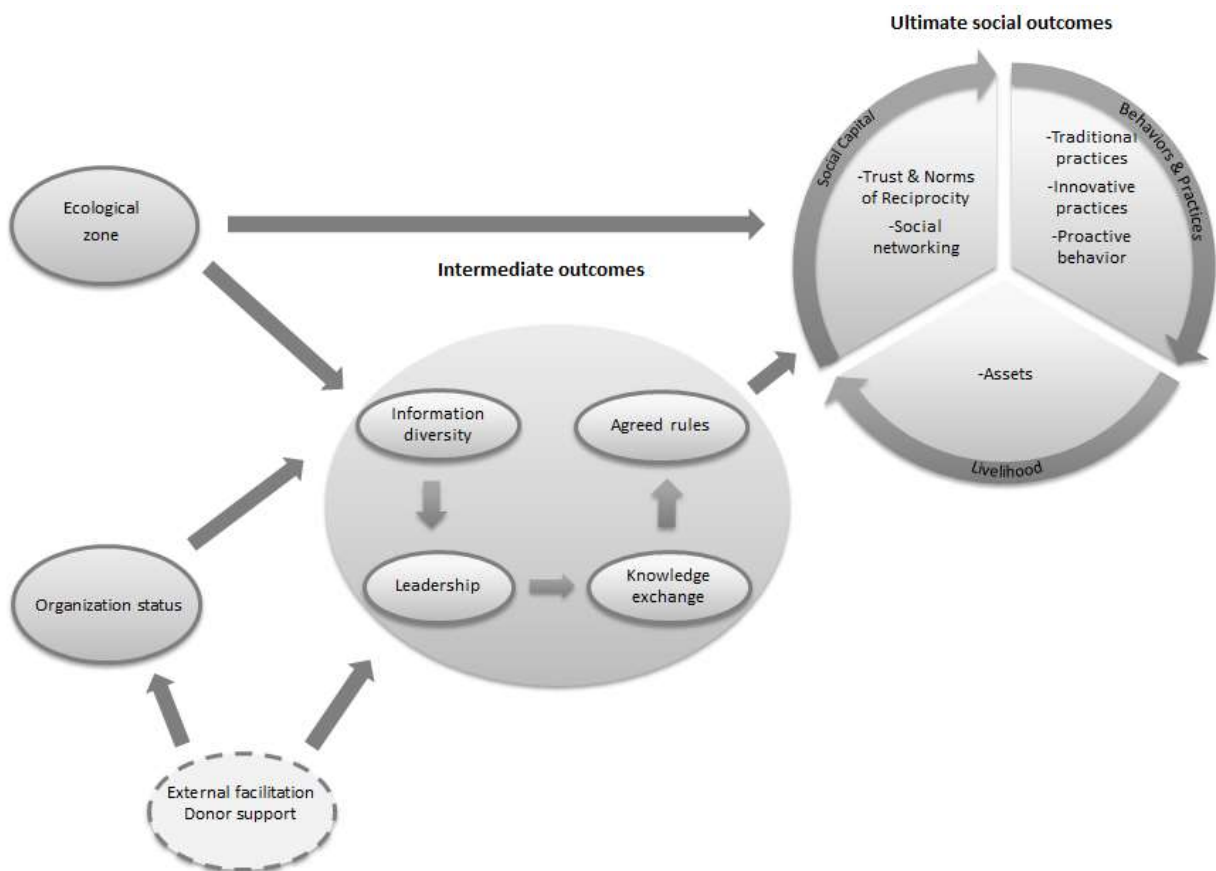


Figure 3.7. The modified conceptual framework of the study for the path analysis reflects the chain of four serial mediators that transfers the effect of organization status onto ultimate social outcomes. The figure also shows a possibility of this relationship being conditioned by ecological zone of the groups.

3.4. Results

In the following subsections we describe the results to address the three research questions stated in the introduction section. First, we report on results to the question about associations between intermediate outcomes for deciding for mediation model in the prior section.

The mediators significantly influenced one another except the relationship between leadership and the presence of rules as Figure 3.4 showed. Among these, information diversity had significantly larger effects on other three mediators: $\beta=.38$ on leadership, $.39$ on rules and $.29$ on knowledge exchange. Leadership had a significant effect on two mediators: information diversity and knowledge exchange (both $\beta=.35$, $p<.01$). Knowledge exchange had a significant positive effect on information diversity and leadership ($\beta=.25$ and $.34$, $p<.01$ respectively) and a negative effect on rules ($\beta=-.19$, $p<.05$). Rules significantly influenced information diversity ($\beta=.31$, $p<.01$) but had a significant negative effect on knowledge exchange ($\beta=-.17$, $p<.05$). We placed the proposed mediators in an ordered chain based on the presence of statistical effect and its magnitude (standardized coefficient value). The sequential order was also verified using information from reports of donor projects about their facilitation approaches (Schmidt et al., 2009; Undargaa et al., 2007). Information diversity was defined as the first variable in the chain of information diversity \rightarrow leadership \rightarrow knowledge exchange \rightarrow rules.

1. Does the model of eight-predictors influence ultimate social outcomes of the groups?

The results showed a significant model fit for all social outcome variables (Tables 3.4-3.5). The latter shows that the model explained larger variations for behavioral variables: R^2 was larger for proactiveness (.53), traditional practices (.38) and innovative practices (.34). Twenty-two percent of the variation in cognitive social capital and 30% of structural social capital was attributed to the model. Only 13% of the variation in household assets was explained by the model.

Table 3.4. Results of Multiple Regressions on Rangeland Practices and Behaviors Variables

Variable name	Traditional practices			Innovative practices			Proactiveness		
	B^1	F	R^2	B	F	R^2	B	F	R^2
Organization status	.20	11.90**	.38	.31	10.13**	.34	.22	20.37**	.53
Ecozone	-.28*			.10			-.03		
Rules	-.15			-.24			-.05		
Information diversity	.31*			.39*			.12*		
Knowledge exchange	.34			.16			.43*		
Leadership	.74			.15			.54*		
Cooperation	.02			.03			.02*		
Income diversity	.57*			.97*			.25*		

* and ** significant at the $p < .05$ and 0.01 level respectively.

¹ B – unstandardized regression coefficient

Table 3.5. Results of Multiple Regressions on Assets and Social Capital Variables

Variable name	Cognitive social capital			Structural social capital			Assets		
	B^1	F	R^2	B	F	R^2	B	F	R^2
Organization status	.05	5.84**	.22	-.12	8.40**	.30	.05	3.60**	.13
Ecozone	-.04*			-.16*			-.08		
Rules	-.13			.10			-.50		
Information diversity	.00			.07			.28*		
Knowledge exchange	.03			.37			-.53		
Leadership	.31*			.63*			.05		
Cooperation	.00			.02			.01		
Income diversity	-.02			-.14*			.20*		

* and ** significant at the $p < .05$ and 0.01 level respectively.

¹ B – unstandardized regression coefficient

More intermediate outcome variables influenced behavioral social outcomes. Five intermediate variables including leadership (.54), knowledge exchange (.43), income diversity (.25), information diversity (.12) and cooperation (.02) significantly influenced proactive behavior at $p < .05$. Information diversity and income sources significantly influenced innovative practices (.39 and .97 respectively) and traditional practices (.31 and .57) at $p < .05$. Ecological zone had a significant negative effect on traditional practices (-.28, $p < .05$). This implied that groups located in northern zones may use fewer traditional practices compared with groups in the southern zones.

The level of cognitive social capital was significantly influenced by leadership (.31) and ecological zone (-.04) at $p < .05$. Similarly, the group's structural social capital was significantly affected by leadership (.63), ecological zone (-.16) and income diversity (-.14) at $p < .05$. The essential household assets were significantly influenced by information diversity (.28) and income sources (.20) at $p < .05$. Cooperation was found to be the least influential among the predictors: its coefficients were very small, and it significantly influenced only proactive behavior (.02 at $p < .05$). We therefore decided to exclude cooperation from the mediator model.

Overall, the model of eight explanatory variables significantly influenced all six social outcome variables, where income diversity significantly influenced five ultimate social outcomes, information diversity four outcomes, and leadership and ecological zone affected three social outcomes each.

2. Is the effect of organization status on social outcomes mediated by the four serial mediators?

We note that the output of the mediation test in PROCESS provides two types of results. Table 3.6 and 3.7 illustrates the first part where direct (c' controlling mediators) and indirect effects (products of all possible combinations of a_i , b_i and d_i tracing paths shown in the statistical diagram in Figure 3.6) were quantified. In principal, these were the output of multiple regressions as we did before with an only difference in number of predictors. The five-predictor model resulted in improved coefficients and

F values, but slightly lower variations attributed to the model (R^2). The results confirmed the significant interdependence of mediators on one another and the directions of the effects as shown earlier in Figure 3.4. However, contrary to our expectations, specific indirect effect of organization status on leadership and knowledge exchange (a_2 and a_3) was not significant. Also, rules had a significant negative effect on cognitive social capital and assets ($b_4 = -.15$ and $-.53$ respectively at $p < .05$). We now move to the second *Total effect* part of the test results.

Table 3.6. Model Summary Information of Organization Status Influence on Traditional Rangeland Management Practices through Serial Multiple Mediators

Independent variables	Dependent variables																			
	<i>M</i> ₁ (<i>Infodiv</i>)			<i>M</i> ₂ (<i>Lead</i>)			<i>M</i> ₃ (<i>KnowExch</i>)			<i>M</i> ₄ (<i>Rules</i>)			<i>Y</i> ₁ (<i>TradPract</i>)							
	<i>Coeff.</i>	<i>LCI</i> ^a	<i>UCI</i> ^b	<i>Coeff.</i>	<i>LCI</i> ^a	<i>UCI</i> ^b	<i>Coeff.</i>	<i>LCI</i> ^a	<i>UCI</i> ^b	<i>Coeff.</i>	<i>LCI</i> ^a	<i>UCI</i> ^b	<i>Coeff.</i>	<i>LCI</i> ^a	<i>UCI</i> ^b					
<i>X</i> (<i>OrgSt</i>)	<i>a</i> ₁	1.56**	1.03	2.10	<i>a</i> ₂	.06	-.06	.17	<i>a</i> ₃	.06	-.05	.16	<i>a</i> ₄	.26**	.13	.40	<i>c</i> '	.33	-.22	.87
<i>M</i> ₁ (<i>Infodiv</i>)	-	-	-	<i>d</i> ₂₁	.10**	.07	.13	<i>d</i> ₃₁	.04*	.01	.08	<i>d</i> ₄₁	.10**	.05	.14	<i>b</i> ₁	.33**	.16	.51	
<i>M</i> ₂ (<i>Lead</i>)	-	-	-	-	-	-	-	<i>d</i> ₃₂	.39**	.24	.54	<i>d</i> ₄₂	-.22*	-.43	-.01	<i>b</i> ₂	.99*	.16	1.82	
<i>M</i> ₃ (<i>KnowExch</i>)	-	-	-	-	-	-	-	-	-	-	-	<i>d</i> ₄₃	-.28*	-.49	-.06	<i>b</i> ₃	.48	-.38	1.34	
<i>M</i> ₄ (<i>Rules</i>)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<i>b</i> ₄	-.35	-1.00	.30	
Constant		6.82**	6.42	7.21		.33**	.10	.56		-.22*	-.43	-.00		-.04	-.32	.24	<i>i</i> _Y	3.99	2.91	5.07
		<i>R</i> ² = .194				<i>R</i> ² = .286				<i>R</i> ² = .364				<i>R</i> ² = .272				<i>R</i> ² = .353		
		<i>F</i> (1, 140) = 33.62, <i>p</i> <.01				<i>F</i> (2, 139) = 27.90, <i>p</i> <.01				<i>F</i> (3, 138) = 26.34, <i>p</i> <.01				<i>F</i> (4, 137) = 12.81, <i>p</i> <.01				<i>F</i> (5, 136) = 14.87, <i>p</i> <.01		

Note. *c*' the direct effect of organization status (*X*) on ultimate social outcome variables (*Y*) holding *M*₁₋₄. *a*₁-*a*₄ are the specific indirect effects of organization status (*X*) on each of four mediators (*M*₁, *M*₂, *M*₃, and *M*₄). *b*₁-*b*₄ are the specific indirect effects of each mediator on a social outcome variable (*Y*) holding *a*₁₋₄. *d*₂₁ *d*₃₁ *d*₃₂ *d*₄₁ *d*₄₂ and *d*₄₃ are the specific indirect effects of each mediator on the subsequent mediator variable.

^a LCI stands for Lower Confidence interval for 95% bias-corrected bootstrap confidence interval. ^b UCI stands for Upper Confidence Interval for 95% bias-corrected bootstrap confidence interval.

* and ** unstandardized coefficient is significant at the 0.05 and 0.01 level respectively.

Table 3.7. Model Summary Information of Organization Status Influence on Behavioral, Social Capital Variables and Assets through Serial Multiple Mediators

Independent variables		Dependent variables														
		Y_2 (InnoPract)			Y_3 (Proactiv)			Y_4 (CognSC)			Y_5 (StrucSC)			Y_6 (Assets)		
		Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b
X (OrgSt)	c'	.45	-.15	1.05	.30*	.06	.53	.06	-.05	.17	-.06	-.35	.23	.12	-.29	.53
M_1 (Infodiv)	b_1	.40**	.20	.59	.13**	.05	.20	-.00	-.04	.03	.08	-.02	.17	.29**	.15	.42
M_2 (Lead)	b_2	.36	-.55	1.28	.66**	.31	1.02	.32**	.16	.49	.68**	.24	1.12	.20	-.43	.82
M_3 (KnowExch)	b_3	.27	-.68	1.22	.47*	.10	.84	.05	-.12	.22	.42	-.04	.88	-.54	-1.19	.11
M_4 (Rules)	b_4	.02	-.70	.74	.03	-.26	.31	-.15*	-.28	-.02	.02	-.33	.37	-.53*	-1.02	-.03
Constant	i_Y	-.77	-1.96	.42	-.70*	-1.17	-.24	1.25	1.03	1.46	.59*	.02	1.16	4.55*	3.74	5.37
		$R^2 = .294$			$R^2 = .516$			$R^2 = .230$			$R^2 = .277$			$R^2 = .173$		
		$F(5, 136) = 11.30, p < .01$			$F(5, 136) = 28.94, p < .01$			$F(5, 136) = 8.13, p < .01$			$F(5, 132) = 10.10, p < .01$			$F(5, 136) = 5.70, p < .01$		

Note. c' the direct effect of organization status (X) on ultimate social outcome variables (Y) holding M_{1-4} . a_1 - a_4 are the specific indirect effects of organization status (X) on each of four mediators (M_1, M_2, M_3 , and M_4). b_1 - b_4 are the specific indirect effects of each mediator on a social outcome variable (Y) holding a_{1-4} . $d_{21} d_{31} d_{32} d_{41} d_{42}$ and d_{43} are the specific indirect effects of each mediator on the subsequent mediator variable.

^a LCI stands for Lower Confidence interval for 95% bias-corrected bootstrap confidence interval. ^b UCI stands for Upper Confidence Interval for 95% bias-corrected bootstrap confidence interval.

* and ** unstandardized coefficient is significant at the 0.05 and 0.01 level respectively.

Table 3.8 shows a significant total indirect effect of organization status on traditional and innovative rangeland management practices and proactive behavior of members ($c-c'=.72$, $.76$ and $.44$ respectively at 95% bias-corrected confidence intervals). Table 3.9 indicates a significant indirect effect of organization status on structural social capital only ($c-c'=.37$ at 95% of CI). Accordingly, the total effect of organization status on these four ultimate social outcomes was significant ($c=1.05$, 1.21 , $.74$ and $.31$ for traditional and innovative practices, proactive behavior and structural social capital respectively at $p<.01$). We note that only proactive behavior had a partial mediation ($c'=.30$ at $p<.05$) while the other three outcomes were fully mediated by the serial-mediators (i.e. no significant direct effect).

The significant indirect effect on four ultimate outcomes was channeled through the information diversity path alone: $B=.52$ on traditional practices, $.62$ on innovative practices, $.20$ on proactive behavior and $.45$ on assets. Information diversity and leadership together transferred the effect of organization onto traditional practices ($B=.16$), proactiveness and structural social capital ($B=.11$ each) and cognitive social capital ($B=.05$) with 95% of bias-corrected CI. Other paths had fairly small indirect effects compared to these two. Figure 3.8 illustrates the two influential paths for the significant indirect effect of the organization status on four ultimate outcomes. A contrast test shown in Table 3.10, indicate a significantly greater specific indirect effect on traditional practices through information diversity compared to the path through information diversity with leadership. However, their effect on proactive behavior had no statistically different contrast.

Table 3.8. Summary of Total and Specific Indirect Effects of Community Organization Status on Behavioral Variables through Serial Mediators

Paths		Dependent variables								
		Y_1 (TradPract)			Y_2 (InnoPract)			Y_3 (Proactive)		
		Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b
Total effect	c	1.05**	.51	1.58	1.21**	.65	1.77	.74**	.49	.99
Direct effect	c'	.33	-.22	.87	.45	-.15	1.05	.30*	.07	.53
Total indirect effect	$c-c'$	.72	.35	1.21	.76	.42	1.34	.44	.23	.65
Specific indirect effects	a_1b_1									
Ind1: through M_1 (Infodiv)	$a_1d_{21}b_2$	.52	.26	.89	.62	.34	1.00	.20	.08	.34
Ind2: M_1 and M_2 (Infodiv, Lead,)	$a_1d_{31}b_3$	.16	.05	.37	.06	-.06	.24	.11	.04	.20
Ind3: M_1 and M_3 (Infodiv, KnowExch)	$a_1d_{41}b_4$	.03	-.01	.14	.02	-.03	.13	.03	.01	.09
Ind4: M_1 and M_4 (Infodiv, Rules)	$a_1d_{21}d_{32}b_3$	-.05	-.07	.02	.00	-.10	.12	.00	-.04	.06
Ind5: M_1M_2 and M_3 (Infodiv, Lead, KnowExch)	$a_1d_{21}d_{42}b_4$	.03	-.02	.12	.02	-.04	.09	.03	.01	.07
Ind6: M_1M_2 and M_4 (Infodiv, Lead, Rules)	$a_1d_{31}d_{43}b_4$	.01	-.00	.06	-.00	-.04	.03	-.00	-.02	.01
Ind7: M_1M_3 and M_4 (Infodiv, KnowExch, Rules)	$a_1d_{21}d_{32}d_{43}b_4$	.01	-.00	.03	-.00	-.02	.01	-.00	-.01	.01
Ind8: $M_1M_2M_3M_4$ (Infodiv, Lead, KnowExch, Rules)	a_2b_2	.01	-.00	.03	-.00	-.01	.01	-.00	-.01	.01
Ind9: through M_2 (Lead)	$a_2d_{32}b_3$	.05	-.04	.24	.02	-.02	.18	.04	-.03	.13
Ind10: M_2 and M_3 (Lead, KnowExch)	$a_2d_{42}b_4$	.01	-.01	.09	.01	-.01	.06	.01	-.01	.05
Ind11: M_2 and M_4 (Lead, Rules)	$a_2d_{32}d_{43}b_4$	.00	-.00	.04	-.00	-.02	.01	-.00	-.01	.00
Ind12: M_2M_3 and M_4 (Lead, KnowExch, Rules)	a_3b_3	.00	-.00	.02	-.00	-.01	.01	-.00	-.01	.00
Ind13: through M_3 (KnowExch)	$a_3d_{43}b_4$	.03	-.01	.19	.02	-.03	.15	.03	-.01	.10
Ind14: M_3 and M_4 (KnowExch, Rules)	a_4b_4	.01	-.00	.06	-.00	-.02	.01	-.00	-.01	.003
Ind15: through M_4 (Rules)		-.09	-.30	.05	.01	-.19	.20	.01	-.08	.09
Contrast: Ind1 – Ind2		.36	.04	.73	.56	.24	.98	.09	-.06	.25
		$R^2 = .097$			$R^2 = .117$			$R^2 = .198$		
		$F(1, 140) = 15.06, p < .01$			$F(1, 140) = 18.50, p < .01$			$F(1, 140) = 34.64, p < .01$		

Note. c' the direct effect of organization status (X) on ultimate social outcome variables (Y) holding M_{1-4} . a_1-a_4 are the specific indirect effects of organization status (X) on each of four mediators (M_1, M_2, M_3 , and M_4). b_1-b_4 are the specific indirect effects of each mediator on a social outcome variable (Y) holding a_{1-4} . $d_{21} d_{31} d_{32} d_{41} d_{42}$ and d_{43} are the specific indirect effects of each mediator on the subsequent mediator variable.

^a LCI stands for Lower Confidence interval for 95% bias-corrected bootstrap confidence interval. ^b UCI stands for Upper Confidence Interval for 95% bias-corrected bootstrap confidence interval.

* and ** unstandardized coefficient is significant at the 0.05 and 0.01 level respectively.

Table 3.9. Summary of Total and Specific Indirect Effects of Community Organization Status on Social Capital Variables through Serial Mediators

Paths		Dependent variables								
		Y_4 (CognSC)			Y_5 (StrucSC)			Y_6 (Assets)		
		Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b	Coeff.	LCI ^a	UCI ^b
Total effect	c	.09	-.01	.19	.31	.03	.58	.33	-.04	.70
Direct effect	c'	.06	-.05	.17	-.06	-.35	.25	.11	-.29	.53
Total indirect effect	$c-c'$	.03	-.05	.12	.37	.18	.61	.22	-.01	.50
Specific indirect effects										
Ind1: through M_1 (Infodiv)	a_1b_1	-.00	-.06	.05	.12	-.03	.27	.45	.24	.74
Ind2: M_1 and M_2 (Infodiv, Lead,)	$a_1d_{21}b_2$	.05	.02	.10	.11	.04	.23	.03	-.06	.17
Ind3: M_1 and M_3 (Infodiv, KnowExch)	$a_1d_{31}b_3$	.00	-.01	.02	.03	.01	.09	-.04	-.12	.00
Ind4: M_1 and M_4 (Infodiv, Rules)	$a_1d_{41}b_4$	-.02	-.05	-.00	.00	-.07	.06	-.08	-.18	-.01
Ind5: M_1M_2 and M_3 (Infodiv, Lead, KnowExch)	$a_1d_{21}d_{32}b_3$	.00	-.01	.02	.03	.00	.07	-.03	-.11	.00
Ind6: M_1M_2 and M_4 (Infodiv, Lead, Rules)	$a_1d_{21}d_{42}b_4$	.01	.00	.02	-.00	-.02	.02	.02	.001	.06
Ind7: M_1M_3 and M_4 (Infodiv, KnowExch, Rules)	$a_1d_{31}d_{43}b_4$	.002	.0001	.01	-.00	-.01	.01	.01	.001	.03
Ind8: $M_1M_2M_3M_4$ (Infodiv, Lead, KnowExch, Rules)	$a_1d_{21}d_{32}d_{43}b_4$	.003	.00	.01	-.00	-.01	.01	.01	.001	.03
Ind9: through M_2 (Lead)	a_2b_2	.02	-.02	.07	.04	-.02	.15	.01	-.02	.12
Ind10: M_2 and M_3 (Lead, KnowExch)	$a_2d_{32}b_3$	.00	-.00	.01	.01	-.00	.06	-.01	-.06	.01
Ind11: M_2 and M_4 (Lead, Rules)	$a_2d_{42}b_4$	.00	-.00	.01	-.00	-.01	.01	.01	-.00	.04
Ind12: M_2M_3 and M_4 (Lead, KnowExch, Rules)	$a_2d_{32}d_{43}b_4$	.00	-.00	.01	-.00	-.01	.00	.00	-.00	.02
Ind13: through M_3 (KnowExch)	a_3b_3	.00	-.00	.03	.02	-.01	.12	-.03	-.17	.01
Ind14: M_3 and M_4 (KnowExch, Rules)	$a_3d_{43}b_4$	.00	-.00	.01	-.00	-.01	.01	.01	-.00	.05
Ind15: through M_4 (Rules)	a_4b_4	-.04	-.10	-.00	.01	-.10	.12	-.14	-.31	-.02
Contrast: Ind1 – Ind2		-.05	-.14	.02	.01	-.22	.17	.42	.17	.74
		$R^2 = .022$			$R^2 = .035$			$R^2 = .022$		
		$F(1, 140) = 3.15, p < .01$			$F(1, 136) = 4.90, p < .01$			$F(1, 140) = 3.15, p = .05$		

Note. c' the direct effect of organization status (X) on ultimate social outcome variables (Y) holding M_{1-4} . a_1 - a_4 are the specific indirect effects of organization status (X) on each of four mediators (M_1 , M_2 , M_3 , and M_4). b_1 - b_4 are the specific indirect effects of each mediator on a social outcome variable (Y) holding a_{1-4} . d_{21} d_{31} d_{32} d_{41} d_{42} and d_{43} are the specific indirect effects of each mediator on the subsequent mediator variable.

^a LCI stands for Lower Confidence interval for 95% bias-corrected bootstrap confidence interval. ^b UCI stands for Upper Confidence Interval for 95% bias-corrected bootstrap confidence interval.

* and ** unstandardized coefficient is significant at the 0.05 and 0.01 level respectively.

3. Is mediated effect of organization status on four ultimate social outcomes moderated by ecological zone?

From the four ultimate social outcomes with the significant mediation effect of four mediators, two were significantly moderated by ecological zone of the groups. Figure 3.9 displays these significant moderation effects detected at $p < .05$. Desert steppe ecological zone had a significant positive moderation of the indirect effect of organization status on proactive behavior through agreed rules ($B = 1.19$). However, steppe ecological zone had a significant negative moderation of the same indirect effect ($B = -.60$). Eastern steppe ecological zone also had a significant negative moderation of the indirect effect of the organization status on structural social capital through leadership ($B = -1.82$).

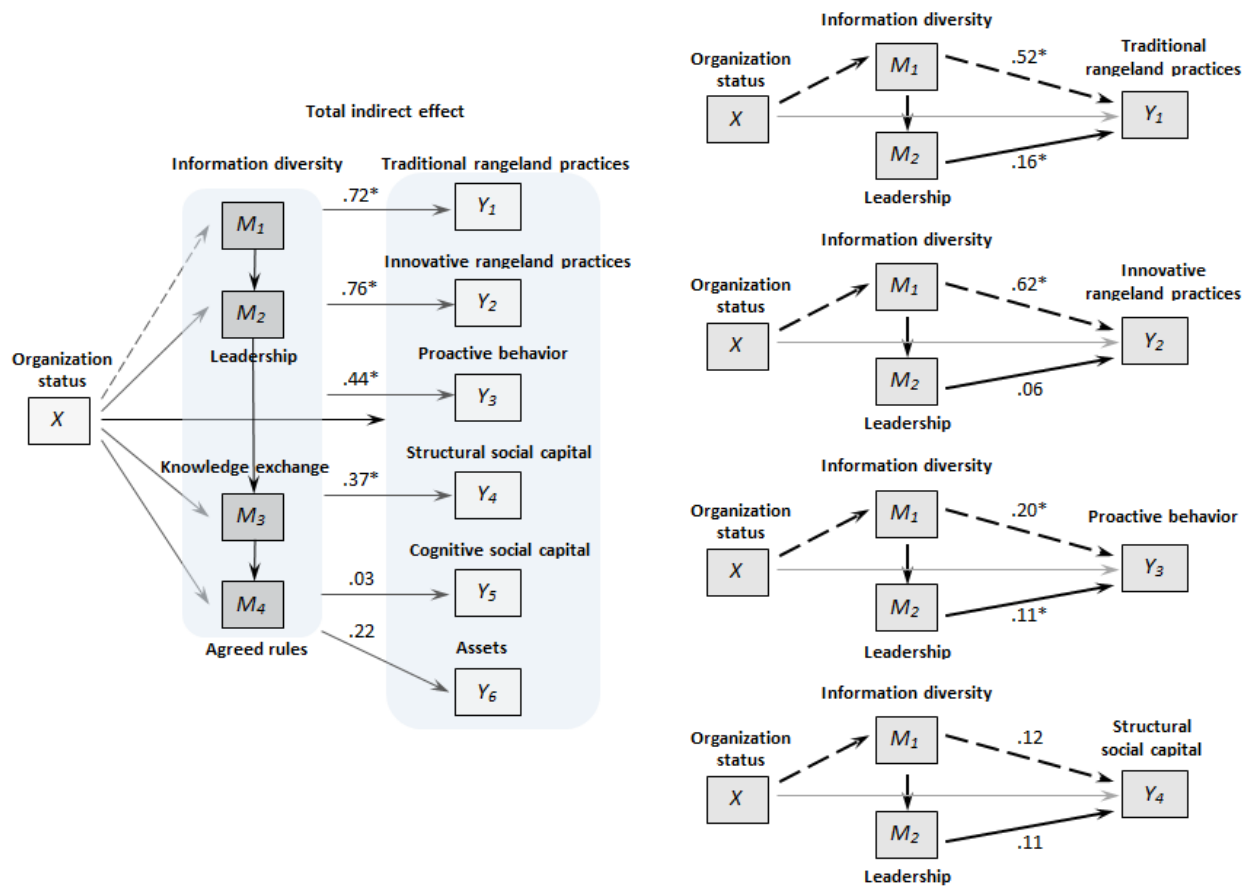


Figure 3.8. The first part shows total indirect effect of organization status on ultimate social outcomes through serial mediators. The second part depicts two most influential mediating paths transferring the effect of organization status onto four ultimate social outcomes. Dashed lines represent the path going through information diversity alone. Solid dark lines represent the second influential path through information diversity and leadership jointly.

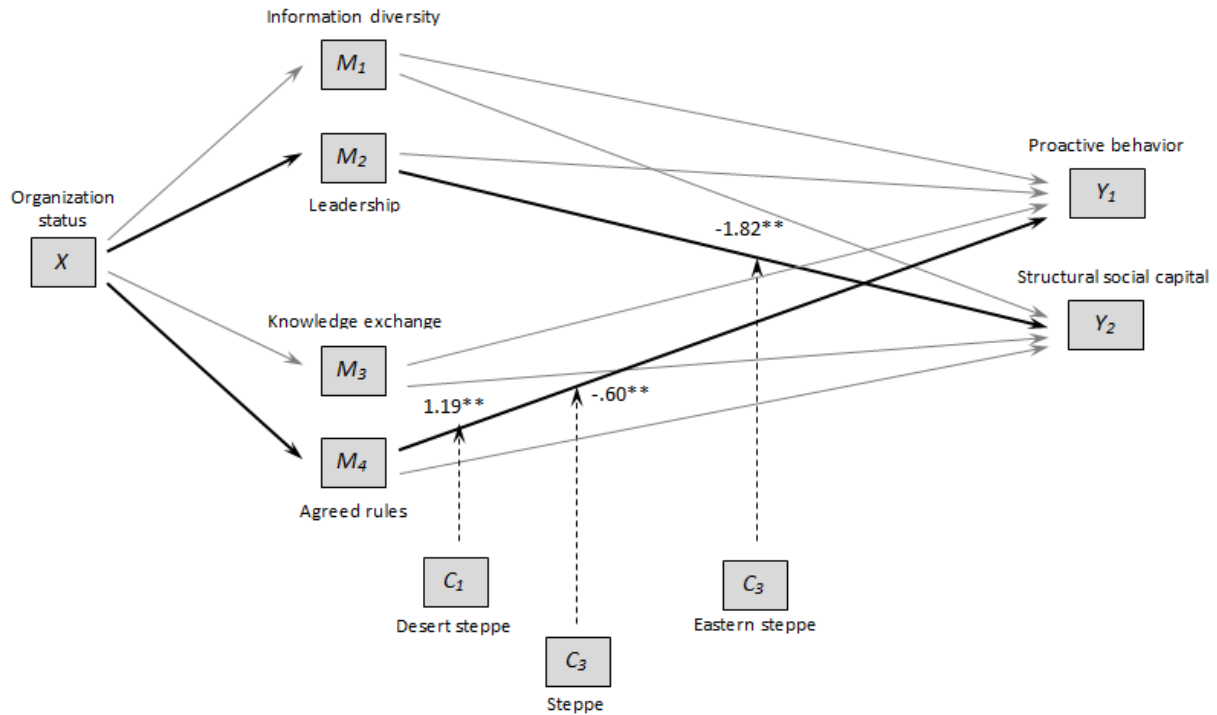


Figure 3.9. Significant conditional indirect effect of the organization status on two ultimate social outcomes through four mediators is shown by solid lines. Desert steppe had a significantly positive moderation (pecked line) of the indirect effect of the organization status on proactive behavior of members through rules. Eastern steppe and steppe zones had a negative conditional indirect effect (pecked line) on proactive behavior and structural social capital through leadership and rules respectively. Unstandardized coefficients are shown at $p < .05$ shown by two asterisk.

3.5. Discussion

The present study aimed to respond to four sub-questions to address the broad research inquiry of how and why formal organization increases social outcomes of CBRM groups. First, we wanted to define if formal organization, six intermediate variables and ecological zone can predict the level of social outcomes of pastoral groups. Secondly, we asked if intermediate outcomes were associated with one another. Next, we wanted to identify whether the positive relationship between the formal organization and ultimate social outcomes was mediated by intermediate outcomes. Lastly, we wanted to understand the role of ecological zone in the underlying mechanisms for achieving social outcomes.

In respect to the first question, the study confirmed that eight factors can predict the level of six ultimate social outcomes: both types of rangeland management practices, proactive behavior, two forms of social capital, and household assets. Predictive relationships were strongest for behavioral and practices variables and less strong for social capital and assets. Income diversity, access to information and leadership were the most influential predictors.

Regarding the second inquiry, we found significant association between the intermediate variables, which had a sequential order. Information access was the triggering variable influencing local leadership, which in turn fostered knowledge exchange among the members, leading to setting rules for resource management. However, rules were negatively associated with leadership and knowledge exchange. In respect to the third question, the results confirmed the mediation effect of four intermediate variables on the positive relationship between the organization status and ultimate social outcomes. However, the mediation effect was found only for proactive behavior, traditional and innovative practices, and structural social capital but not for cognitive social capital and household assets. The most influential paths to transfer the effect of organization status onto four ultimate social outcomes were through information diversity, and information diversity together with leadership.

Lastly, ecological zone moderated the indirect effect of organization status on two ultimate social outcomes. In other words, the magnitude of the mediation effect of intermediate outcomes was dependent on ecological zone. Specifically, the desert ecological zone had a positive moderation effect on the path to proactive behavior through agreed rules. The steppe ecological zone had a negative moderation effect on the same path. We also found a negative moderation of the eastern steppe ecological zone on the path to structural social capital through leadership. These results mean that ecological zone influences the variability of the mediation effect on ultimate social outcomes. In the following paragraphs, we will provide more detailed discussions addressing the proposed conceptual framework.

Our results were consistent with prior findings that an increase in social outcomes related to behavior and rangeland management practices due to the formal organization was more solid (Chapter 2). Fostering proactive behavior of members required most of the intermediate factors while increasing traditional and innovative rangeland practices and assets were related to better access to information and diversified income sources. Leadership played an important role in increasing social capital of pastoral groups. The level of both cognitive and structural social capital was dependent on a group's ecological zone. Confirming our prior results, the desert steppe ecological zone had greater social capital including both cognitive and structural types. Similarly, ecological zone influenced traditional rangeland management. Among the intermediate variables, income diversity, access to information, and leadership had the greatest influence on ultimate social outcomes (Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012).

Contrary to theoretical predictions, rules had a consistent negative effect on most ultimate social outcomes except structural social capital, although the effect was not significant. This negative effect may indicate that rules were not devised by group members, causing their ineffectiveness. CPR theory and past research have highlighted the importance of resource users' participation in designing and enforcing rules (Ostrom et al., 1994). The degree of ownership of the rules by resource users was considered to be the important factor for success of CBNRM (Measham & Lumbasi, 2013). Moreover, potentially negative content of the rules may pressure users, prevent their trust and create more conflicts. For instance, in the pastoral context of high variability of resource availability both spatially and temporally, rules encouraging exclusive access rights to the resources with clear boundaries have been shown to be inadequate (Cleaver, 2002; Dyson-Hudson & Smith, 1978; Hogg, 1992). Such exclusivity alters essential pastoral strategies of mobility and flexibility to accommodate forage variability across time and space (Turner, 2011). Research found that exclusive rules of the organized groups in the Mongolian Gobi desert were ineffective (Addison, 2012; Fernandez-Gimenez, 2002), which

was consistent with our earlier findings (Chapter 2). Nevertheless, further study is necessary to examine the reasons for the negative influence of rules on social outcomes of the groups.

The results of the path analysis showed that the increase in leadership and knowledge exchange of pastoral groups was not directly associated with the formal organization (Table 3.7) when other mediators were considered. Rather, these increases were related to influences of other mediators; information diversity for leadership, and both information diversity and leadership for knowledge exchange. Our prior results (Chapter 2) showed that the greater leadership in CBRM groups was only due to members' report on the presence of a helpful organization in their soum. Hence, this result may show the general decrease in leadership in rural Mongolia. It could also indicate the ineffectiveness of facilitation approaches to foster greater leadership among pastoralists. Both leadership and knowledge exchange significantly reduced the presence of rules. Such result might indicate one of the two possibilities. For those with already strong leadership and knowledge exchange and informal norms make formal rules unnecessary and possibly counter-productive. Conversely, it could be the lack of support from local leaders and experienced herders to existing resource rules, possible for the reasons speculated earlier. Additionally, the facilitation approach may have been inappropriate to ensure active participation and commitment of the local leaders, who are the key stakeholder in the local resource management.

The larger mediation effect on rangeland practices compared to proactive behavior and structural social capital provides important evidence that intermediate outcomes are more effective in encouraging both types of rangeland management practices than the other two outcomes. Further, the fact that the path through information diversity alone was more powerful than the path through information diversity together with leadership for these two types of rangeland practices is worth noting. It may imply that adequate education and training is the key for herders to revive proven traditional practices and learn about new adaptive methods for resource management. The lack of a

significant total effect on cognitive social capital was consistent with the earlier finding of the weak difference in this measure between CBRM and non-CBRM members (Chapter 2). Nevertheless, we highlight the fact that the significant positive specific indirect effect on cognitive social capital was transferred by five different paths, although the magnitude of each indirect effect was very small. This may point to the emerging nature of social capital, as proposed in Chapter 2. In addition, it hints at the complexity of strengthening trust and norms of reciprocity among resource users. Strengthening social capital would require multiple of mediators, unlike rangeland practice outcomes. Significantly negative specific indirect effects of rules and information diversity and rules on cognitive social capital and assets were consistent with the results of the five-predictor regressions of the path analysis. Further study is needed to understand how rules were set and their content, in order to explain this negative relationship.

The desert steppe ecological zone had a positive moderation effect on the mediated effect of organization status on proactive behavior through agreed rules. This can be explained by the greater level of social capital among desert steppe group members, which in theory would make it easier for group members to agree upon rules that meet their needs. As suggested above, if members designed their own rules, there would be greater ownership and commitment to enforce them. Their experience of enforcing those rules could encourage them to bring issues to local authorities and suggest changes in current pasture coordination. In contrast, the negative moderation of the steppe ecological zone on the same indirect effect may indicate a lack of self-devised rules. Our prior results showed the high level of social capital, leadership, and knowledge exchange among the steppe groups that determined the level of proactive behavior. Hence, this moderation effect can be associated with rules only. The negative moderation effect of the eastern steppe ecological zone on structural social capital may be related to their low leadership level (shown in the prior study) as the path was mediated by this variable.

3.6. Implications

This study has several implications for theory, methods and practice. First, the results largely confirm the benefits of formal CBNRM organizations for achieving social outcomes, especially, reviving traditional practices, introducing adaptive innovations in rangeland management, encouraging proactive behavior and social networking of pastoralists (Fernandez-Gimenez et al., 2014; Leisher et al., 2012). The lack of an effect on social capital and household assets indicate the complexity for achieving these outcomes. In the Mongolian pastoral context, all eight conceptually-grounded factors including formal organization, ecological zone and six intermediate variables, were important to attaining greater social outcomes. This study contributes to commons theory by identifying underlying mechanisms for the positive relationship between formal organization and improved social outcomes. It shows that without intermediate variables, formal organization alone is not sufficient to achieve social outcomes.

Information and training are especially critical to fostering social outcomes of Mongolian pastoral institutions (Baival & Fernández-Giménez, 2012). We showed that information triggers an ordered chain of mediation by encouraging local leadership and fostering knowledge exchange among community members that prepares them for setting collective rules for resource management. Further, this study deepened our understanding of how resource characteristics shape commons institutions. The fact that two ecological zones had a different effect on the same mediation path implied “when” and “for whom” this effect works. Based on these findings, we propose that CBRM has produced mixed results in the past due to the lack of understanding among those facilitating CBRM about mediating factors for desired social outcomes, and underlying order between mediators. With the consistent results across our two studies, we suggest that social outcomes such as proactive behavior of individual members and their daily resource use practices are “fast” variables, which are “building blocks” for fostering trust and norms of reciprocity and social networking among members. These are at the heart of commons institutions to overcome inherent “social dilemmas” and require broader interactions beyond household

and kin relationships. We suspect that starting facilitation for rule setting when resource users are at the stage of strengthening weakened social capital can be premature. Without increased social capital, it is difficult to achieve more complex social and ecological outcomes such as improved livelihoods and better resource conditions. Hence, in the pastoral context, the pace of progress seems to be important. The groups under the study had an average five-year experience of collective action and could achieve outcomes related to daily rangeland practices and self-mobilization for contributing to rangeland matters. This implies that the process would require more time and experience for revitalizing trust among the resource users and strengthening reciprocal relationships.

Several policy implications emerge from this study. First, facilitation efforts and policy incentives for CBRM development should prioritize information and training to herders first and foremost. In the absence of information and training (as shown by the case of the control groups), it will be difficult to achieve necessary levels of leadership and knowledge exchange to proceed with rule-setting arrangements for resource management. Second, self-organized groups need to achieve desired changes in members' behavior and their rangeland practices first to build groups' confidence then to foster subsequent goals of improving trust, strengthening norms of reciprocity, and social networking.

Building commons institutions requires long-term persistent efforts to achieve improvements in livelihoods and resource conditions. In this regard, the current practice of five-year projects by most multi-lateral and bi-lateral donors in Mongolia may not be adequate strategy. Empirical assessments of self-governing commons institutions raised concerns over rigid logical framework planning and fixed timing of donor programs supporting local institutions (Corson, 2011). Given a genuine interest in the development of sustainable institutions for local resource management, donors may need to consider reviewing this short-timed funding approach for CBNRM initiatives.

From a methodological perspective, the serial multiple mediators' model of the path analysis provided a powerful tool to define mechanisms for social outcomes of Mongolian pastoral groups

(Hayes, 2013). Despite some limitations, PROCESS software was critical in terms of providing statistical power for the analyses with its bootstrapping procedures while releasing all normality requirements of parametric statistics.

Finally, this study calls for further research to define potential influences of facilitation approaches on social outcomes of formally organized groups. For example, we recommend qualitative inquiry to elucidate why rules have a negative effect on social outcomes of pastoral groups, and why local leadership and consultation with experienced individuals negatively influence for the presence of rules. Lastly, a closer look at specific governance processes within community groups in different ecological zones would help explain differing levels of social outcomes across four ecological regions.

CHAPTER FOUR: INSTITUTIONAL DESIGNS THAT MATTER MOST FOR COMMUNITY-BASED RANGELAND MANAGEMENT IN MONGOLIA?

Summary

This study tested the applicability of institutional design principles for predicting social outcomes of evolving pastoral institutions in post-socialist Mongolia. We assumed increased social outcomes as an integral part of long-enduring commons institutions. We had two types of dependent social outcomes: intermediate and ultimate social outcomes. Intermediate outcomes were mediating factors for achieving ultimate social outcomes. Given the donor-driven nature of community-based rangeland management (CBRM) in Mongolia, we also examined the effect of donor facilitation on institutional design. We collected data from 77 CBRM groups and 392 member households in 18 soums (counties). We compared facilitation approaches of three external donors.

We found that donor facilitation significantly influenced group attributes and the external environment of the CBRMs, but had no effect on institutional arrangements. The study confirmed that small size, homogeneous interests, and heterogeneity of well-being are important group characteristics that can predict higher levels of intermediate social outcomes including information diversity, leadership, and income diversity. Institutional arrangements such as the presence of sanctions, group-devised rules, frequent meetings, and recording group documents increased cooperation, agreed rules, and information diversity. Similarly, access to training and local government support provided a favorable external environment for these intermediate outcomes.

Group characteristics such as dependence on livestock, homogeneity of interests and leader legitimacy were critical for increasing social capital, livelihoods, desired rangeland practices, and proactive behavior of members. Among institutional arrangement variables, frequent meetings of leaders were the most influential for ultimate social outcomes. Local government support and ongoing

donor assistance were associated with increased trust and norms of reciprocity, rangeland management practices, proactiveness, and livestock holdings. In summary, group attributes and external environment were more influential determinants of social outcomes of pastoral CBRMs in Mongolia compared to institutional arrangements.

4.1. Introduction

Mixed outcomes of commons institutions have triggered greater scientific attention to what contributes to desirable results of local resource management regimes. The debate around “the drama of the commons” (NRC, 2002) has gained significance because of a growing belief in the potential of local communities and their institutions to manage natural resources (Agrawal & Gibson, 2001; Berkes, 1989; North, 1990; Ostrom, 1990). Many view commons institutions as more effective than the state and market regimes given appropriate conditions (Oba et al., 2000). Such a paradigm shift seriously challenges proponents of state-led or neo-liberal solutions to resource management (Demsetz, 1967). In addition, this perspective offers options for addressing the dilemmas of common pool resource (CPR) management framed as the tragedy of the commons, prisoner’s dilemma (Hardin, 1968), and problem of collective action (Olson, 1965).

Persistent scientific efforts on the topic inspired by Ostrom (1990) have resulted in a “well-developed framework” (Agrawal, 2014, p. 89) of design principles for commons institutions and the institutional development process (Ostrom, 2008). After analyzing 91 cases that tested the framework, Cox et al. (2010) found it to be a viable basis for future research. However, the framework also has been criticized for being incomplete (Agrawal, 2001; Baland & Platteau, 1996; Schlager et al., 1994), rigid (Blaikie, 2006; Cleaver, 2000) and for placing too much emphasis on rules while not accounting for social complexity (Blaikie, 2006; Cleaver, 1999). The critics were also concerned about the possibility of the framework being applied as a “blueprint” for governance of commons institutions rather than being

understood as a set of propositions or general features of successful commons management (Agrawal, 2002). In response, Ostrom highlighted the importance of “matching the rules of a system to the underlying biophysical world and type of human community involved” (2008, p. 16).

The institutional design framework has been used to assess the effectiveness of commons institutions managing a range of resource types in varying social-ecological settings. However, interest in testing the framework for pastoral institutions has been modest; only 7% of the 91 cases reviewed by Cox et al. was in the pastoral sector (2010, p. 7). Notwithstanding, recent years have seen growing enthusiasm of pastoral commons scholarship for using institutional design principles or some of the individual elements represented by Turner (2011) Quinn et al. (2007), Beyene (2014), Akudugu (2013) Schnegg and Linke (2015) and Crewet (2015), among others. This study aims to contribute to this scientific endeavor by examining the theoretical framework in the context of Mongolian pastoral commons management.

By examining the effectiveness of different rangeland institutions’ designs in post-socialist Mongolia, we intend to assist the current institutional development efforts towards sustainable management of rangeland resources (Fernandez-Gimenez et al., 2014; Upton, 2011; Usukh et al., 2010). Institutional strengthening is imperative in the context of increasing vulnerability of and risks to pastoral communities precipitated by ongoing climate change (Dagvadorj et al., 2010; Nandintsetseg & Shinoda, 2013) and the transition to a democracy and market economy in the early 1990s (Fernandez-Gimenez et al., 2014; Fernández-Giménez et al., 2012; Upton, 2012). Our focus was on the social outcomes of the pastoral institutions as an integral part of institutional success and sustainability. We defined social outcomes as any positive status in the social well-being of group members, including useful resource management practices, constructive behavior, improved social capital, and livelihoods. Using data from 77 community-based rangeland management (CBRM) groups facilitated by external donors in three different ways, we addressed the following two research questions: (1) does group type or donor

facilitation influence the institutional design of CBRMs in Mongolia?, and (2) which institutional design elements have the strongest influence on social outcomes for Mongolian pastoral groups?

This study builds on the results of our prior research assessing social outcomes of CBRM in Mongolia. Findings of early analyses demonstrated that the externally supported CBRM groups had greater social outcomes compared to traditional neighborhood (non-CBRM) groups (see Chapter 2). These social outcomes included rangeland practices, behavior, and social capital with exceptions of livelihood measures for income and livestock of member households. We also found that the level of rules and cooperation of the desert steppe CBRM groups did not differ from adjacent traditional groups. Our examination of relationships between formal organization and social outcomes revealed that six intermediate outcomes including information diversity, leadership, knowledge exchange, cooperation, income diversity and the presence of agreed rules given ecological zones significantly influenced the ultimate social outcomes (see Chapter 3). The former four intermediate outcomes significantly mediated the effect of formal organization for increasing the levels of rangeland practices, constructive behavior, and social networking during emergencies. In other words, the increase in these ultimate social outcomes was associated with not only the group's formal organization, but also four factors, which included information diversity, leadership, knowledge exchange, and rules. This study examines the effectiveness of various institutional design variables in achieving greater social outcomes of pastoral institutions.

In the following sections, we explain the theoretical foundation of the study and its operationalization in the Mongolian pastoral context. Following the details of the research method, we report the results of the data analyses in the order reflected in the conceptual framework. The discussion section elaborates on the results with specifics to Mongolian pastoral social-ecological systems highlighting relevant historical and cultural aspects. The last section summarizes the theoretical, methodological, and practical implications of the study results.

4.2. Conceptual Framework

Figure 4.1 illustrates a conceptual framework of this study. Guided by prior studies on Mongolian CBRM (Baival, 2012; Leisher et al., 2012; Usukh et al., 2010), we conceptualized that donor facilitation approaches influence Mongolian community-based institutions primarily in terms of group attributes, institutional arrangements for internal governance and rules, and their external relationships. In line with design principles theory and supporting empirical studies (Agrawal 2001, Cox et al, 2010, Ostrom, 1990), these sets of institutional design elements will influence both intermediate and ultimate social outcomes of pastoral groups. Originally, the design principles were identified as “facilitating conditions” (Wade, 1988) for “long-enduring” (Ostrom, 1990) or “sustainable” (Agrawal, 2002) commons institutions. As we consider favorable social outcomes to be an essential indicator of successful commons institutions, we assumed a positive association of design principles with social outcomes of resource user groups.

In the following subsections, we will elaborate on theoretical constructs and their operationalization in the Mongolian pastoral context. First, we describe the origin of CBRM in Mongolia and existing types of CBRM groups as shaped by their respective donors. We then explain our selection of institutional design variables dictated by specifics of pastoral social-ecological systems in Mongolia. Finally, we define what constitutes social outcomes for Mongolian pastoral groups.

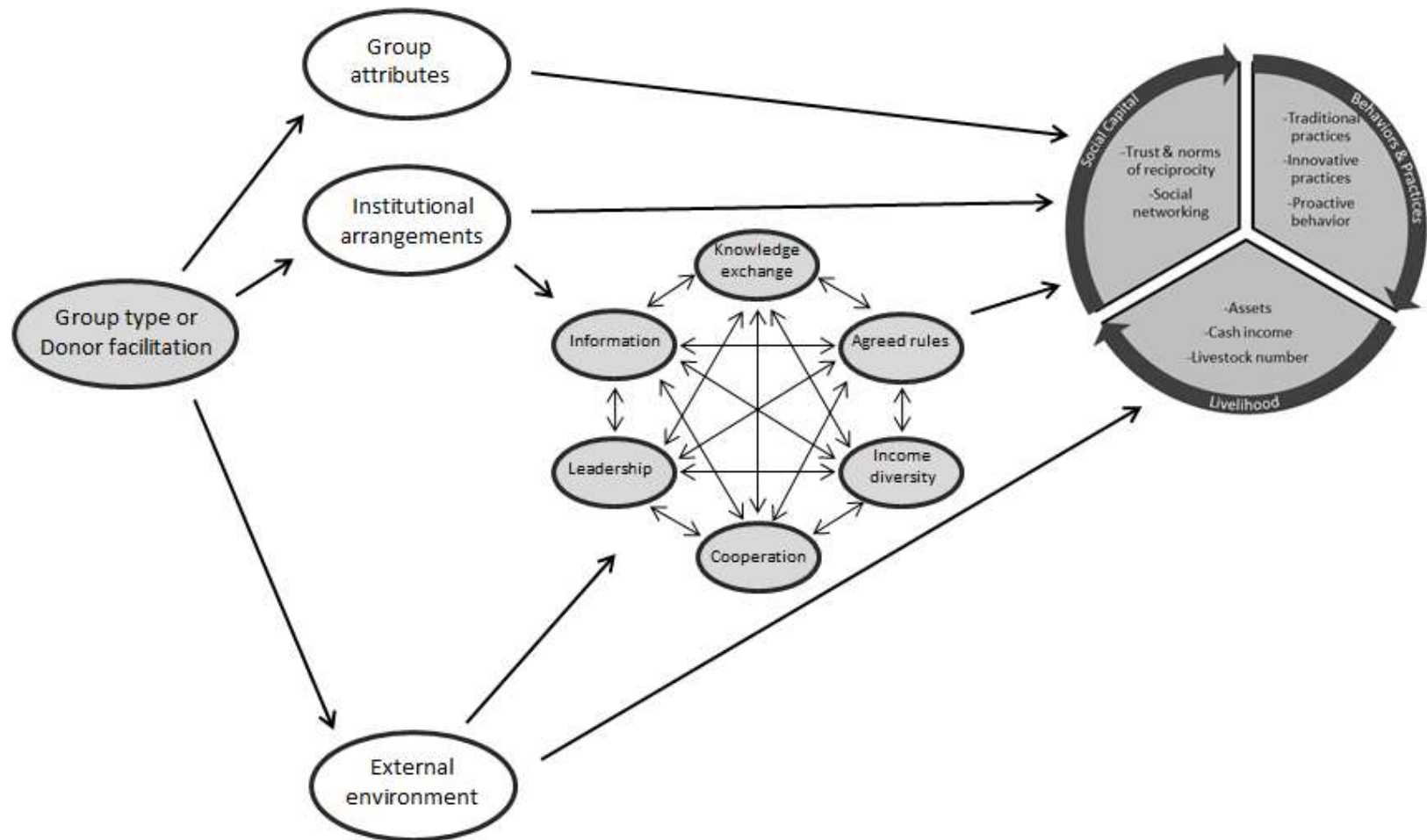


Figure 4.1 Conceptual framework depicts a primary influence of external facilitation on the institutional designs including group attributes, institutional arrangements and groups' external environment, which, in turn, affect both intermediate and ultimate social outcomes of groups.

4.2.1. Group types by donor facilitation.

Pioneering projects of the German Technical Cooperation (GTZ) and United Nations Development Program (UNDP) in the late 1990s (Ministry of Nature and Environment, 2007; Schmidt, 2006) implemented the first community-based management projects in Mongolia. The process of engaging herder communities in natural resource management was further expanded by other external donors, initially in response to a series of *dzud*²⁴ (severe winters) that caused high livestock mortality from 1999 to 2001. These efforts gradually led to institution-building objectives for rangeland management that was substantially weakened by the transitional reforms such as the de-collectivization and livestock privatization. According to a UNDP (2006) herder group assessment, by 2006 there were 14 programs facilitating over 2000 herder groups in 19 aimags (provinces) of Mongolia. This study sampled pastoral groups supported by four external donors: UNDP, New Zealand Nature Institute (NZNI implemented GTZ project), Swiss Development Agency (SDC) and Wildlife Conservation Society (WCS). Donors named the groups they supported differently. Groups under UNDP projects were *herder groups*, SDC's groups were *Pasture User Groups* or *PUGs*, and groups assisted by NZNI named themselves *nukhurluls* (Schmidt et al., 2009). This study adopted these naming conventions. NZNI and WCS *nukhurluls* were classified together because former NZNI facilitators assisted in the formation of the first WCS groups by applying the same facilitation strategies (WCS, 2010) as they used for *nukhurluls*.

From numerous donor reports, it is clear that facilitation strategies of the community-based projects were mostly shaped by experiences of the GTZ/NZNI program (MSRM, 2010; Schmidt et al., 2009; UNDP, 2004). The GTZ/NZNI program started CBRM facilitation efforts in 1998, while others commenced later: UNDP in 2003, SDC in 2005, and WCS in 2006. Donors reported implementing a participatory, bottom-up approach where the project facilitated initial problem analysis and planning

²⁴ *Dzud* is a Mongolian term for severe winter conditions with extremely low temperatures (possibly combined with climatic events such as snow blizzard or storm) that prevent livestock accessing forage causing starvation and freeze leading to mass mortality.

together with resource users (Leisher et al., 2012). The donors applied co-management methods by bringing together relevant stakeholders including local government, the Protected Area Administration Office, the Soum²⁵ Buffer Zone Council or Soum Pasture Co-management Committee as well as other donors working in the same soum (NZNI-IPECON, 2006; UNDP, 2008). All donors proactively aligned project objectives with the agendas of the national government such as Millennium Development Goals (MDGs) and various UN conventions (MSRM, 2010; UNDP, 2006). As a result, the projects had good liaisons with related officials at the ministerial and provincial offices, which linked their work with multiple levels of the government.

A major difference among the donors was their approach to CBRM membership. Groups established with assistance of UNDP and NZNI/WCS, had voluntary membership. Some households chose not to participate in CBRM group activities although they shared the same resources with CBRM members. Hence, this approach had limitations for improving rangeland condition as some resource users were not part of the rules for restraining access to resources. For this reason, SDC adopted a territory-based approach, where CBRM membership was mandatory for all households sharing the same resources (Usukh et al., 2010).

Another difference between the donors was their capacity-building focus for resource management. For instance, donors of voluntary groups had biodiversity conservation objectives, which shaped their facilitation strategies (Schmidt, 2006; UNDP, 2008; WCS, 2010). In contrast, territory-based groups had support for sustainable rangeland management only. The different membership approach, conservation program focus and, possibly, other dissimilarities in facilitation not obvious to outsiders may have shaped institutional designs of CBRMs in Mongolia. This motivated us to test the effect of group types a.k.a. donor facilitation approach on institutional designs for formal groups. In addition, this

²⁵ Soum is a rural district, the administrative unit below aimag (province).

study also identifies which facilitation approach produced design elements favorable for successful commons institutions.

4.2.2. Design principles for successful commons institutions.

A substantial number of studies contributed to the identification of enabling conditions or design elements for successful commons institutions (Agrawal, 2002; Baland & Platteau, 1996; Cox et al., 2010; Ostrom, 1990; Pagdee et al., 2006; Thompson, 2013; Wade, 1988). From these, we applied variables suggested by Agrawal (2002), who critically reviewed prior recommendations and incorporated new variables addressing the existing criticism. We selectively chose variables from three sets of variables in the original list excluding the resource characteristics (Refer to Table 4.1). Theorized attributes of the resource system such as small size, well-defined boundaries, and predictability are not easily applicable to pastoral rangeland systems (Behnke et al., 1993; Ellis & Swift, 1988; Fernandez-Gimenez, 2002; Fernandez-Gimenez & Le Febre, 2006; Niamir-Fuller & Turner, 1999). In other words, this model predicts unsuccessful outcomes for pastoral institutions lacking all these resource characteristics. In addition, our focus was on social outcomes rather than on overall institutional success including improved resource condition. Due to the comprehensive explanations of these variables by Agrawal, we will highlight only added variables, and some differences from the original list as shown in Table 4.1.

Table 4.1. "Critical Enabling Condition" Variables by Agrawal (2002) versus Measured Institutional Design Variables

Theorized enabling conditions	Institutional design variables	Variable operationalization/Survey questions
Group characteristics		
i. Small size	i. Group size	Number of individual members
ii. Clearly defined boundaries		
iii. Shared norms		
iv. Past successful experiences – social capital	iv. Group experience	Years members worked together as a group
v. Appropriate leadership	v. Leaders' legitimacy	Level of acceptance and legitimacy of the leadership among the group members and members of broader community
vi. Interdependence among group members		
vii. Heterogeneity of endowments, homogeneity of identities and interests	vii.a. Heterogeneity of well-being vii.b. Homogeneity of interests	Diversity of four categories of subgroups within a group including wealthy, average, poor and very poor Members recognize the value of the group and share the same goals
viii. Low levels of poverty	viii. Poverty level	Number of poor, very poor, single-woman headed and no livestock households within a group
High levels of dependence on resource system	Dependence on livestock	Percentage of livestock income in total household income
Institutional arrangements		
i. Rules are simple and easy to understand	i.a. Ease of rules i.b. Awareness of rules	Ease of rules for herders to understand Level of members awareness of the existing rules
ii. Locally devised access and management rules	ii. Group-devised rules	Origin of rules: devised by the group, rules identical to other groups, rules identical to other groups but substantially modified for group's own condition
iii. Ease in enforcement of rules	iii. Quality of rules	Fairness of rules, rules respected by members, rules clear about punishment for violation, and flexible for emergencies
iv. Graduated sanctions	iv. Presence of sanction	Presence of punishments for violation of agreed rules coded as 0 (no sanction) and 1 (yes sanction)
v. Availability of low cost adjudication		

Continued...

Continued from Table 4.1

“Critical Enabling Condition” Variables by Agrawal (2002) versus Measured Institutional Design Variables

Institutional arrangements	<i>Added governance variables:</i>	
	Leaders’ meeting	Frequency of group leaders’ meeting
	Members’ meeting	Frequency of members meeting
	Meeting attendance	Members’ attendance in group meetings
	Transparency	Availability of records/documentation for examination by others
	Documents records	Number of documents the group records/maintains
<hr/>		
External environment		
i Technology: a) low-cost exclusion technology; b) time for adaptation to new technologies related the commons		
ii Low levels of articulation with external markets	ii. Market integration	Ease of accessing market by group members, calculated using GIS spatial analyst tool that considers distance and slope as costs for travel between two points
iii Gradual change in articulation with external markets		
iv State: a) central governments should not undermine local authority; b) supportive external sanctioning institutions; c) appropriate levels of external aid to compensate local users for conservation activities; d) nested levels of appropriation, provision, enforcement, governance	iv.a. Local government support	Group’s working relationship with local government, its input and influence in local rangeland polices
	iv.b. External cooperation	Cooperation with other CBRMs ^a , scientific organizations, NGOs, and donors
	iv.c. Ongoing donor support	Recently received financial and technical assistance from the donor
	iv.d. Donor approach	Voluntary membership versus territory-based membership
	iv.e. Access to training	Organization of knowledge exchange and learning events by the group

^a CBRMs – Community-Based Rangeland Management groups

We added internal governance-related variables into the set of institutional arrangements (Thompson, 2013). Frequency of group meetings indicates lively collective action, where members discuss their plans, implementation issues, and information exchange on emerging matters. Similarly, frequent meetings of leaders demonstrate their enthusiasm, organization, and commitment to group endeavors. Attending group meetings is a costly activity for pastoralists who are scattered long distances from each other, because it involves fuel costs to reach the meeting place, their time away from herding and other important household chores. Good meeting attendance despite these trade-offs demonstrates a strong interest of members in group undertakings and enthusiasm for active participation.

In addition to these organizational events, it was important to assess the extent to which decisions and deliberations were recorded and the accessibility of these documents to others. Recording and safely storing meeting decisions and other important group information are challenging tasks for frequently moving pastoralists. Usually, a few better-educated members with secretarial duties maintain documentation and keep them safe. Keeping good records and communicating their contents to members shows a formal level of group organization. Likewise, ease of accessing these documents by anyone interested in the examination indicates the level of organizational transparency and internal democracy.

Reflecting specifics of CBRM in Mongolia, we added several variables to the set of the external environment variables. As explained above, international agencies played an essential role in shaping the external environment of CBRMs. Group cooperation with other local organizations/CBRMs, outside researchers and NGOs was determined by the donor's ability to facilitate such relationships (NZNI-IPECOM, 2006; Upton, 2008). This facilitation often took place in the forms of training, workshops, and field activities in the project target areas. Donors covered all costs for bringing experts and materials to the community for these activities. Without this support, groups had limited capacity to organize forums

for knowledge exchange and learning involving all community members. Hence, access to training, important for the group's social outcomes, was subject to external assistance. In addition, we added a categorical variable indicating a voluntary versus territory-based approach to membership. Lastly, we included an ongoing donor support variable to test a prevailing view that, when donor support ends, CBRM positive effect ceases (Leisher et al., 2012; Upton, 2012).

To avoid the problem of “too many variables” (Agrawal, 2002), we conducted a thoughtful review of institutional design sets in relation to the study context. Several variables were considered constant for the Mongolian pastoral social-ecological systems. These included external variables such as population, state influence, and technology, which remained relatively uniform in rural areas for the recent decades. A peculiarity of the latter for the pastoral economy is that the harvest rate is not directly dependent on technology as it is the case for sectors such as forestry or fishing (Haller & Merten, 2008). Rather, possession of trucks, tractors, motorcycles, cell phones and satellite dishes for TV, increase members' access to resources, and their mobility, storage and information exchange (Fernandez-Gimenez et al., 2014). Due to a strong influence of such technical advancement on local power relationships (Haller & Merten, 2008; Tenenberg, 2008), technology integration seems to be a more important group attribute for Mongolian pastoral institutions rather than the external environment as theorized. Regarding relationships between resource characteristics and group attributes, there is a clear overlap of pastoral communities' location and their pastures (Fernandez-Gimenez, 1999; Mearns, 1996a). We also considered shared norms (Baland & Platteau, 1996) for rangeland management as constant among Mongolian pastoralists. Fernandez-Gimenez (2000) highlighted roles of shared norms of reciprocity during the emergencies and avoiding out-of-season grazing of spring and winter pastures significant for pastoral commons institutions. Although there could be variations in terms of strength of such shared norms and place specifics across different areas, these

are always present as part of the cultural identity of Mongolian nomads (Bazargur et al., 1989; Simukov, 1934; Upton, 2005).

4.2.3. Ultimate social outcomes.

As shown in Figure 4.1, we selected three sets of ultimate social outcome variables. Most evaluations of CBNRM consider livelihood outcomes and changes in resource conditions as key measures of CBNRM success (Conley & Moote, 2003; Hibbard & Lurie, 2012; Plummer & Armitage, 2007). Following our research objectives, we focused on social outcomes related to the socio-economic well-being of Mongolian pastoralists rather than rangeland condition. Consequently, livelihood, social capital and rangeland management practices, and behavior present the ultimate social outcomes of CBRM institutions in Mongolia.

For Mongolian pastoralists, livestock is the primary asset that defines wealth and power (Murphy, 2014; Sneath, 1999). Access to technology and equipment is also important to household production. Essential assets such as vehicles, tractors, cell phones, and TV increase production capacity and herders' access to information, which is critical in vast sparsely populated areas. Possession of these assets, a viable number of livestock, and cash income determine the capability of rural herding communities to meet their subsistence needs and address risks under uncertain and variable environmental conditions (Fernandez-Gimenez et al., 2012; Fernandez-Gimenez et al., 2011).

Previous research suggests that community members engaged in cooperation under agreed rules for managing common resources were more likely to adopt ecologically-friendly practices and behaviors for resource use (Baival et al., 2011; Ostrom & Hess, 2010; Upton, 2008). We considered two existing forms of rangeland practices in Mongolia. Traditional practices include those activities inherited from millennia-long adaptation of the nomads to their lands (Fernandez-Gimenez, 2000), which are proven strategies for sustainable rangeland management (Fernandez-Gimenez, 2000, 2006; Rossabi,

2005). Innovative practices brought by supporting donor agencies or government include fencing key resource areas, monitoring pasture condition, improved animal breeding, and growing forage plants. All of these incorporate technological developments that may be seen as “both a motor and a product of social change”(Sneath, 1999, p. 223). Additionally, individual members’ proactive behavior on issues related to resource management is important in the group’s collective action. Consequently, the more groups implement traditional and innovative rangeland management practices and show proactive behaviors, the better their natural resource and livelihood outcomes would be.

Theoretical models of commons institutions emphasize how social capital variables such as trust, norms of reciprocity and group member’s social networks influence both livelihoods and resource conditions. These three dimensions (Putnam, 1993) interact with each other and facilitate social outcomes through collective action and democratic governance (Titeca & Vervisch, 2008) while reducing its transaction costs (Ostrom, 1990). We adopted Uphoff et al’s (2000) concept of cognitive and structural social capital and measured both types among the group members. Trust and norms of reciprocity together with other social values were defined as cognitive social capital specific to local (micro) individual level (Grootaert, 2002) “resulting from mental processes”, while, social networking was called structural social capital (Uphoff et al., 2000, p. 4). Structural social capital was further subcategorized as bonding (horizontal network of like-minded individuals with similar social status) and bridging (ties with actors from different social or cultural backgrounds) social capital (Putnam, 2000, p. 22). For pastoralists, strong bonding and bridging social capital present essential risk management strategies important for overcoming both household-level risks and community-wide covariate hazards such as dzud and droughts (Fernandez-Gimenez et al., 2012; Swift, 1995).

4.2.4. Intermediate social outcomes.

The intermediate outcomes shown in Figure 4.1 include six variables: access to information, local leadership, opportunity for knowledge exchange, cooperation and income diversification and a presence of rules to constrain resource use. Studies assessing successes of the CBNRM argue that these intermediate variables play an important role in ultimate achievements of CBNRM (Measham & Lumbasi, 2013) (NACSO, 2008; USAID, 2009).

Ostrom in her foundational work (1990) showed that the ability to obtain and exchange credible information is an important factor for collective action of local users. The same applies to Mongolian pastoral groups. In post-socialist Mongolia, abrupt transitional reforms resulted in limited access to information as well as lack of training, skills, and government services, which all contributed to rural vulnerability (Marin, 2008; UNDP, 2011). With the demise of state-sponsored institutions in the early 1990s, Mongolian herders lost their regular access to mail and newspaper delivery, local libraries, cultural clubs and mobile cinema²⁶. These items had previously played a significant role in their daily activities and education as a population that lived remotely across large geographic areas with limited transportation and communication (Rossabi, 2005; Sneath, 1999).

The transition to the market system required herders selling their products and purchasing necessities on their own, while dealing with laborious herding tasks under highly uncertain environments. In addition, pastoralists lacked forums and discussions to share their issues and exchange ideas that would help them network with each other (Swift, 1995). Many externally-funded CBNRM programs targeted filling this gap (Upton, 2008; Usukh et al., 2010) by initiating information delivery and local forums in remote rural communities.

During the socialist era, the state cooperatives provided leadership in rangeland management including allocation of pasture, coordination and support for of seasonal movements, emergency

²⁶ In 1987 Mongolia had 455 cultural clubs, 498 mobile cinema projectors, and 404 libraries with at least one per each collective which were 255 at the time (Academy of Science, 1990).

assistance, training and education, marketing and social services (Fernandez-Gimenez, 2001; Mearns, 1996a; Rossabi, 2005). Most collective leaders were either experienced herders or professionals in livestock husbandry who had a strong knowledge of traditional practices and specifics of the local ecological conditions (Swift, 1995). However, a few recent studies reported deteriorating trust in local formal leaders and wealthier community members who demonstrated individualistic strategies under the new market settings (Murphy, 2014; Rossabi, 2005; Upton, 2008).

Traditionally, Mongolian pastoralists cooperated regularly at different levels of rangeland institutions. At the neighborhood level, cooperation included coordinating use of pastures, hay areas, water sources, and salt licks, as well as labor sharing for nomadic movements, clearing pastures from snow, or searching for lost animals (Mearns, 1996b). Some authors noted revival of such traditional cooperation following decollectivization, which was weakened during the state cooperative times (Mearns, 1996a). Others noted some forms of new cooperation encouraged by technical assistance projects (Upton, 2008; Usukh et al., 2010) such as fencing key resource areas for protection, monitoring pasture condition, and planting vegetables.

Overall, we expected that the direction of the effects of design variables on social outcomes would be positive as specified by Agrawal shown in the first column of Table 4.1. We also hypothesized that the higher the scores of governance variables, the greater the social outcomes would be. Based on the specifics of CBRM development in Mongolia, we anticipated a larger influence from the external environment on the groups' social outcomes compared to group attributes and institutional arrangements.

4.3. Methods

4.3.1. Sampling design.

Our unit of analysis was local rangeland user groups. Following a methodological guidance of the International Forestry Resources and Institutions (IFRI), a user group is defined as a set of individuals who use and maintain rangelands within a specific geographic location for consumptive or non-consumptive purposes (IFRI, 2013). Data of the study were collected from 77 purposively sampled formal groups in 18 soums, which had the support of the aforementioned technical assistance organizations. Geographically, these groups were located across four ecological zones of Mongolia as shown in Figure 4.2.

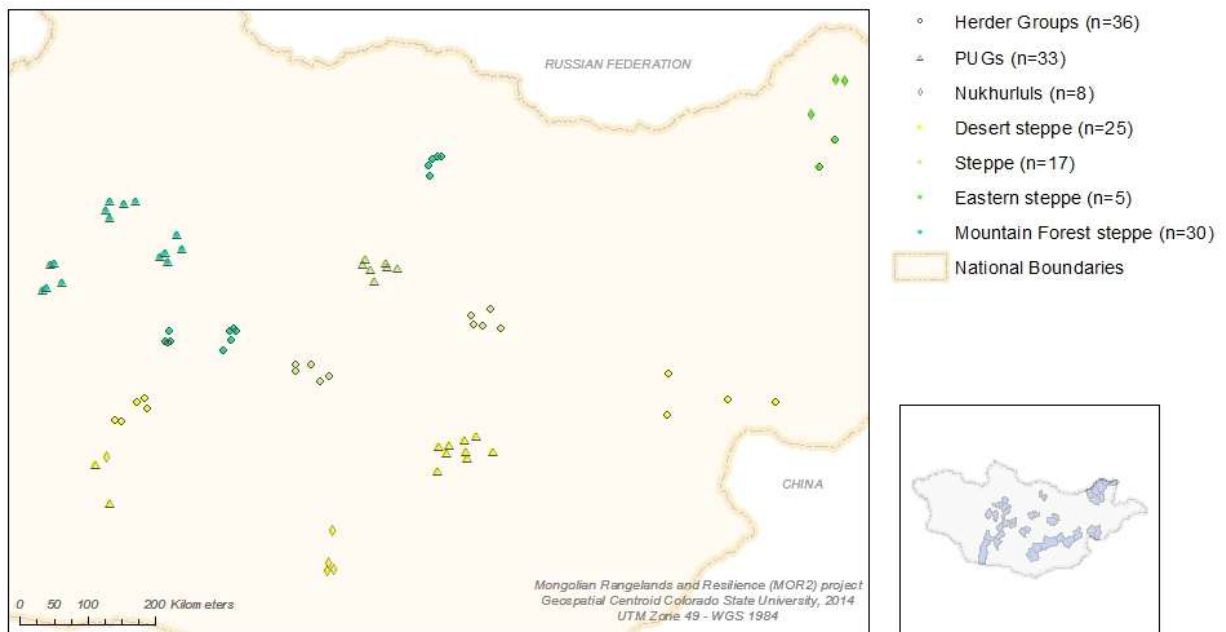


Figure 4.2 Map of study sites showing three group types and their locations across four ecological zones

In SDC-supported soums, the sampling was random as most of the soum herder households enrolled in the project due to the donor's territory-based approach of mandatory membership (Usukh et

al., 2010). On the contrary, in soums with UNDP, NZNI and WCS projects, which had voluntary participation in the CBRM, we had smaller sampling frames with limitations for random selection.

Figure 4.3 details the sample sizes, representativeness and survey instruments we used. Further division of 77 groups by donor types resulted in unequal samples of 36 herder groups, 33 PUGs, and eight nukhurluls. At the household level, samples varied from 3 to 7 families per formal group. Overall, we had 202 member herder group households, 155 PUG households, and 35 nukhurlul households.

We designed the research instruments on the basis of prior studies in Mongolia's rangelands (Fernandez-Gimenez, 2001; Fernandez-Gimenez & Batbuyan, 2004; Fernandez-Gimenez et al., 2012), applying the IFRI approach (IFRI, 2013). Household interviews were quantitative questionnaires measuring member household's demographics, livelihood, rangeland management practices, norms and behaviors, and their social networks. At the group level, we conducted interviews with group leaders and focus groups of the members. Based on information from member household questionnaires, focus groups, and leader interviews, the study team synthesized an organizational profile survey for each community group. This organization profile contained the group's general information, organizational management, and social relations.

The instruments were originally developed in English and then translated into Mongolian for data collection purposes. Two teams of Mongolian social researchers collected data between April 2011 and June 2012. The collected data were entered into two separate Microsoft Access databases, which were designed in the same format as respective survey instruments. For the data analysis, we transferred the stored data into SPSS 22 software.

4.3.2. Variables.

Our choice of two different statistical tools, ANOVA and multiple regressions, dictated different roles of key variables. Dependent variables in ANOVA functioned as independent variables in the multiple regressions.

4.3.2.1. Independent variables.

In ANOVA tests, group type was the independent categorical variable including herder groups, PUGs and nukhurluls. In the multiple regressions, we had three sets of independent institutional design variables including group attributes, institutional arrangements, and external environment (Agrawal, 2001). Descriptives of the variables are shown in Table 4.2. Skewness in the variables' curves was used to evaluate the normality of data distribution, where the values between +1.0 and -1.0 were considered acceptable given the robustness of parametric statistical tests (Vaske, 2008, p. 276).

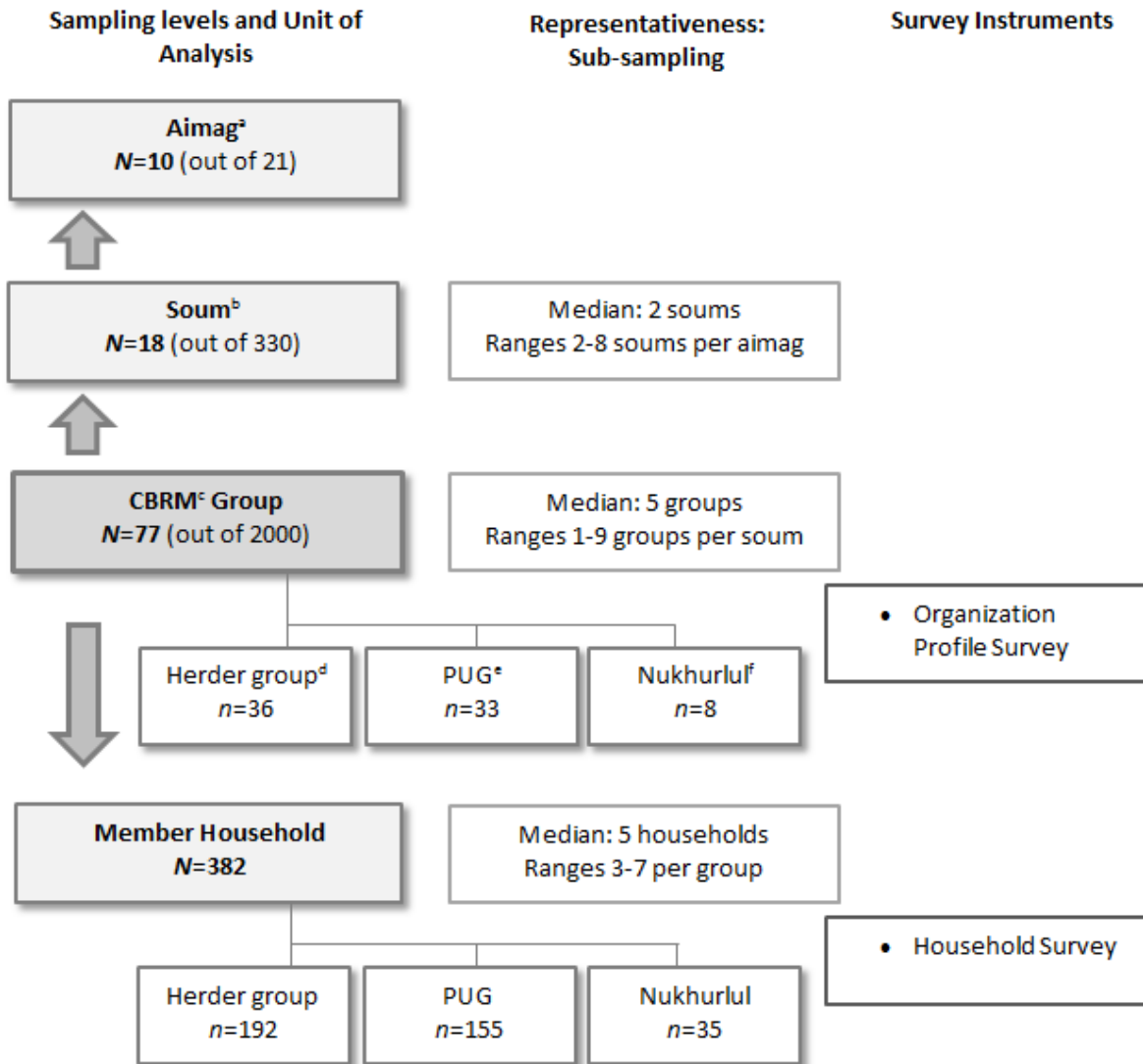


Figure 4.3. Sampling design and size, survey instruments used for the comparative study of formal groups (N=77) in Mongolia

^a Aimag is the largest administrative unit in Mongolia equivalent of province. ^b Soum is a rural district, the administrative unit below aimag. ^c CBRM stands for Community-based Rangeland Management refers to formally-organized groups. ^d Groups supported by United Nations Development Programme (UNDP). ^e Groups supported by Swiss Development Agency (SDC). ^f Groups supported by New Zealand Nature Institute (NZNI) and Wildlife Conservation Society (WSC).

In the following paragraphs, we will describe each variable and explain mean values of some of them that are not easily intuitive.

Group attributes comprised of seven measured variables. Group size was the number of individual members in a CBRM group with substantial variation due to large sizes of PUGs occasionally reaching 482 persons. Group experience was the number of years of group operation from its formation to the study year. Leader's legitimacy was a categorical variable showing a degree of leader's acceptance as perceived by group members including 1 (*not accepted at all*), 2 (*accepted by the majority*) 3 (*accepted by the minority*) and 4 (*openly accepted*). Because it is a categorical variable, a mean of 3.3 for example, shows members' evaluation of their leaders being accepted by a minority of the members and having little legitimacy. Heterogeneity of well-being was a proxy for measuring heterogeneity of endowments using normalized Blau's index²⁷ for assessing diversity as a maximum variety within the group members (Harrison & Klein, 2007).

²⁷ Blaus index was calculated using the equation: $1 - \sum p_k^2$ where $k=4$ categories of perceived well-being: (1) better-off, (2) average (3) poor, and (4) very poor

Table 4.2. Descriptives of Institutional Design Variables (N=77)

Variable name	Description/codes	Mean	SD	Skewness
<i>1. Group attributes</i>				
Group size	# of individual members	89	86.43	2.25
Group experience	Years since formation	5	3.01	.77
Leaders' legitimacy	1-none to 4-high	3.3	.27	-.53
Heterogeneity of well-being	0-no; 1-high	.47	.22	-1.22
Homogeneity of interests	0-no; 2-high	1.62	.36	-1.04
Poverty level	% of vulnerable households	11%	15	3.76
Dependence on livestock	% of livestock income	65%	15	-.93
<i>2. Institutional arrangements</i>				
<i>Rules:</i>				
Ease of rules	0-complex; 3-easy	2.57	.58	-.96
Awareness of rules	0-no one; 5-everyone	3.31	1.14	-.23
Group-devised rules	1-from outside; 3-self-devised	1.61	.80	.82
Quality of rules	0-very poor; 4-very good	2.96	1.23	-1.05
Presence of sanction	0-no sanction; 1-yes, sanction	.50	.51	
<i>Governance:</i>				
Leaders' meeting	1-not regular; 8-weekly	3.18	2.02	.15
Members' meeting	1-not regular; 8-weekly	3.41	1.82	-.31
Meeting attendance	1-few; 3-almost all	2.38	.66	-.61
Transparency	1-only officials; 5-public	4.33	.90	-2.25
Documents records	15 types of records	7.63	4.06	.15
<i>3. External environment</i>				
Access to training	0-no access; 3-very good	1.99	1.11	-.63
Local government support	0-no support; 3-good support	1.31	.55	.07
External cooperation	1-no cooperation ; 3-high	1.38	.73	.11
Ongoing donor support	0-none; 2-financial/technical support	.72	.83	.57
Donor approach	1-voluntary, 2-territory-based			
Market integration	spatial continuous in km	107	53	.48

It ranged between 0 and 1, where 1 indicated the highest diversity. Homogeneity of interests was the mean of two items asking the presence of shared values and goals among members. Poverty level was the percentage of vulnerable members including households with perceived poor and very poor status and families with no livestock and single female heads. Dependence on livestock was a proxy for members' dependence on rangeland resources calculated as a share of livestock income in the total household income.

Institutional arrangement variables had two sub-types: rule variables and governance variables, each comprising five measured variables. Ease of rules was coded on a 3-point scale of (*difficult to understand*), (*can be understood*), and (*easy to understand*). Rule awareness was measured at a 5-point scale of (*no one knows*), (*a few people*), (*half the people*), (*almost everyone*) and (*everyone*). An average score of awareness of rules (3.31) means that half of the members were aware of the rules. Group-devised rules were coded as 1 (*adopted from others*), 2 (*adopted from others but made substantial modification*), and 3 (*did not adopt from others*). The mean for group-devised rules indicated that on average, group rules were identical to other CBRM rules, but had substantial modification to adjust to the groups' specifics. Quality of rules measured members' evaluation of rules fairness, acceptance, clarity for sanctions, and flexibility for emergencies. It was a sum of these four items. An average evaluation of members for quality of rules (2.96) was "good rules". Presence of sanction measured the presence of enforceable punishments for rule breaking.

Regarding governance variables, frequency of leaders' meetings, and members' meetings was assessed from 1 (*not regularly scheduled*) to 8 (*once a week*). Averages for the two variables (3.18 and 3.41) show that these meetings mostly take place once a year. Meeting attendance was evaluated on a 3-point scale of (*few members*), (*about half the members*), and (*almost all members*). Transparency was a categorical variable showing the degree to which group records were available to others, with codes from 1 (*only available to organization officials*) to 5 (*available to general public*). The mean value for transparency (4.33) was coded as "documents can be accessible only by members of the organization". Documents records were a sum of eight types of organization records such as members' profile, financial documents and meeting minutes, etc.

We operationalized external environment variables using six measures. Access to training was a sum of three dichotomous items of groups' reports about learning and knowledge exchange events they organized. We assumed that these kinds of learning opportunities were possible due to groups' access

to external support of government or development organizations. Local government support was an average of five items asking groups' working relationship with soum and aimag government, groups' input in local policies of rangeland management and influence in policy changes. Items were coded as 0 (*insufficient information to evaluate*), 1 (*low/negative*), 2 (*medium/neutral*), and 3 (*high/positive*). We reasoned that participation in and influence on local policies was possible only when the local government was supportive of such contributions. External cooperation was a sum of four reported items on groups' cooperation with other local organizations and CBRM groups as well as external non-governmental, scientific organizations and international agencies. The codes were the same as in the local government support variable. Ongoing support was a sum of two items of groups' report on recent financial and technical assistance that they received from their donor. Donor approach was a categorical variable coded as 1 (*voluntary approach*) and 2 (*territory-based approach*).

We calculated the market integration variable using a least cost path analysis within a geographical information system (GIS). For evaluating pastoral groups' access to market, we considered the fact that Mongolia²⁸ has underdeveloped roadways but active consumption of motor transport means including vehicles and motorcycles.²⁹ In the study, more households reported selling their cashmere, a product with the highest commercial value, at aimag markets. Hence, we calculated the distance to market, adjusting for steepness of slopes³⁰ in the terrain as distance to the aimag center. We made two assumptions. First, herders will go to the nearest aimag center, not necessarily to their administratively affiliated aimag. Second, the cheaper the travel in terms of time and distance to an aimag center, the higher the group's market integration will be. We used Shuttle Radar Topography

²⁸ According to U.S. Central Intelligence Office's World Factbook, in 2013, Mongolia ranked 78th among 222 countries in terms of its development of roadways with 90% of roads being unpaved (U.S. Central Intelligence Agency, 2014).

²⁹ Data from the National Statistical Office shows that there is at least one motor vehicle per 20 residents in the study aimags (NSO, 2014). Moreover, 79% of the study households reported about their possession of a motorcycle.

³⁰ We limited the slope steepness to be less than 35 degree which is feasible for travel by standard motorcycles or passenger vehicles.

Mission (SRTM) data downloaded from the website of Consortium for Spatial Information of Consultative Group on International Agricultural Research or CGIAR-CSI with a resolution of 90 m x 90 m for each pixel. We assumed the average travel speed in rural Mongolia as 50 km per hour. We estimated the cost of moving across a pixel with a triple increase per each 10-degree rise in slope. Using these assumptions, we calculated speed for traveling across a flat terrain or no slope to be 6.48 meters/second and 19.44 m/s for corresponding 10-degree increase in slope. We converted the calculated cost-distance to kilometers.

4.3.2.2. Dependent variables.

In ANOVA, all institutional design variables were dependent while there were two types of dependent variables in the multiple regressions: intermediate and ultimate social outcomes (Refer to Table 4.3). Intermediate outcome variables included information sources available to the members, perceptions about leadership, including community and local government leaders, knowledge exchange within and outside of the group, agreed rules for rangeland management among members, income sources of the member households, and group cooperation.

Table 4.3. Descriptives of Social Outcome Variables (N=77)

Variable name	Description	<i>M</i>	<i>SD</i>	Range	Skewness
Independent variables					
Group type	categorical; 3 types ^a			1-4	
Intermediate outcomes:					
Rules ^b	Mean of 5 types on a scale of 0-2	.57	.45	0-1.4	.58
Cooperation	Sum of 39 cooperation types	16	7.18	0-31	.05
Information diversity ^c	Sum of 16 information sources	8	1.89	3.4-12.6	-.17
Knowledge exchange ^{c,d}	Mean of 4 items on a scale of 0-2	.68	.34	.05-1.48	.34
Income diversity ^c	Sum of 17 income sources	3	.51	2-4.33	.54
Leadership ^{c,e}	Mean of 4 items with 0-2 scales	1.24	.35	.38-1.90	-.10
Social outcomes:					
Livelihood:					
Assets ^c	Sum of 15 household assets	7	1.21	3.5-9.2	-.22
Cash income ^{c,f}	Per capita annual income in USD	223	362.97	-372-1222	.50
Herd size ^{c,g}	Per capita livestock number in SFU ^h	123	71.09	14-302	.63
Social capital:					
Cognitive social capital ^{c,i}	Mean of 6 items	1.64	.30	.42-2.0	-1.64
Structural social capital ^c	Sum of 13 items	2.31	.88	.5-4.25	.11
Behavior:					
Traditional practices ^c	Sum 16 traditional practices	8	1.69	4-13	-.15
Innovative practices ^c	Sum of 19 innovative practices	4	1.89	0-9	.79
Proactiveness ^c	Sum of 4 proactive items	1.81	.85	.33-3.80	.26

^a Group type included herder groups (1) supported by UNDP, Pasture User Groups or PUGs (2) supported by Swiss Development Agency, and nukhurluls facilitated by New Zealand Nature Institute and Wildlife Conservation Society. ^b Rules is a group level variable coded as 0 = No Rules, 1 = Traditional or Informal Rules. ^c These variables from household survey dataset were aggregated to the organization level by taking the mean value for the sampled households within each organization or neighborhood group. ^d Knowledge exchange items were coded as 0 = None, 1 = Some (1-3 people) and 2 = Many (3+ people). ^e Leadership items were coded as 0 = Disagree, 1 = Neutral and 2 = Agree. ^f This winsorized variable trimmed 3% of the distribution at each end and replaced those values with -1,195 and 2,283, the next valid values at each side of the distribution to address extreme outliers (Vaske, 2008, p. 562). ^g This semi-winsorized variable trimmed the upper 3% of the distribution and replaced those values with 555, the next valid value in the distribution to address extreme outliers (ibid.). ^h Sheep Forage Unit is used to estimate forage use by different types of grazing and browsing animals. In Mongolia 1 camel is equivalent of 5 SFU, 1 horse is 7 SFU, 1 cattle – 6 SFU, 1 goat - 0.9 SFU. ⁱ Cognitive social capital items were reverse coded as 0 = Agree, 1 = Neutral and 2 = Disagree.

Three of the intermediate outcome variables were dichotomous and indicated the presence of cooperation, sources of information and income for member household. The cooperation had two types: a) traditional activities (16 items) that groups used to do from pre-collective and collective times and b) those relatively new ones (23 items) introduced since livestock privatization in the mid-1990s. We

note that these two forms of cooperation somewhat overlap with two rangeland management practices in terms of types because herders cooperate in these dominant rangeland practices. However, methodologically, these are two different variables measured separately; cooperation was measured at the group level while practices were measured at the member household level.

The remaining three intermediate variables had response scales: knowledge exchange assessed if the members have someone to consult and exchange ideas on essential topics of rangeland management. Leadership measured the presence of legitimate local leaders. Lastly, agreed rules indicated the presence of rules for five regulation areas including grazing time, livestock number, and species, use of wells and hay fields.

Ultimate social outcomes comprised of three main variables: livelihood, social capital and rangeland practices and member's behaviors. We measured livelihood using three variables: possession of essential household assets, annual per capita net cash income in USD³¹ and livestock number per household member (aka. per capita) in sheep forage unit³². Cognitive social capital measured the level of trust and norms of reciprocity among members. Structural social capital indicated the presence of bonding and bridging social ties of the members. Behaviors and practices included reports of traditional and innovative rangeland management practices. Proactiveness was measured using members' responses on their actions and initiatives related to local rangeland issues.

We calculated six of eight ultimate outcome variables from the household dataset. We aggregated household variables to the organization level by taking the mean value for the sampled households within each organization.

³¹ Cash values were converted to USD for two reasons: a) to reduce decimal numbers in MNT (Mongolian tugrik at the exchange rate of 1USD=1712 as of January 2014) and b) to ease reader's understanding of the values by expressing them in a more commonly used currency than MNT.

³² Sheep Forage Unit is used to estimate forage use by different types of grazing and browsing animals. In Mongolia 1 camel is equivalent of 5 SFU, 1 horse is 7 SFU, 1 cattle – 6 SFU, 1 goat - 0.9 SFU

The survey response rate was complete for most of the variables ($N=77$) except two missing cases in ultimate social outcomes. Table 4.3 displayed value ranges of the variables to give an idea of the location of the group mean for a particular variable along the existing interval. Reliability tests for the scale variables were performed to verify the internal consistency of items as shown in Table 4.4. As shown in Table 4.2, three variables including group size, poverty level, and transparency were fairly skewed. For the multiple regressions, we standardized institutional design variables due to the skewness detected as well as differences in scales and units.

4.3.3. Analysis.

We used ANOVA to answer the first research question “Does group type or donor facilitation influence design of CBRMs in Mongolia?” Our goal was to identify the most effective facilitation type thus there were no specific predictions. For multiple comparisons of outcomes between the group types, we used the Games-Howell procedure, known to be the most robust for non-orthogonal and simultaneous tests for unequal samples with unequal variances like ours, to control family-wise error rates (Hilton & Armstrong, 2006; Toothaker, 1993). We also tested strength of the relationship between the independent and dependent variables (effect size) for assessing practical significance of a statistical difference (Vaske, 2002). We chose eta squared as a measure of effect size suitable for comparisons of more than two sets of observations within a single study (Lakens, 2013).

Next, we tested items of institutional design variables that had a statistically significant difference among the group types. Such item analyses helped to define where the differences between the types occur, which greatly facilitated interpretation of the results. Among several variables with statistical differences, we prioritized those with larger effect sizes or greater magnitude of effects (Lakens, 2013; Vaske, 2008). Considering a small sample size of nukhurluls ($n=8$), we set p -value at .10 for statistical tests.

Table 4.4. Descriptives and Reliability of Items in Index Variables for Community-Based Rangeland Management (CBRM) Groups (N=77)

Variables, scales and items	N ^a	Mean	SD	Cronbach's <i>alpha</i> if item deleted	Cronbach's <i>alpha</i> ^f
Knowledge exchange^b:					.81
Livestock health, reproduction, and nutrition	380	.83	.65	.78	
Livestock marketing	380	.67	.72	.78	
Pasture rotation and resting	379	.67	.69	.73	
Disaster preparedness and risk management	378	.58	.68	.75	
Cognitive social capital^c:					.77
People always try to help each other	381	1.78	.57	.76	
People help each other in times of need	380	1.74	.58	.75	
Most people are trustworthy	380	1.78	.49	.75	
People mainly look out for themselves ^d	380	1.42	.78	.72	
People will take advantage of others ^d	380	1.63	.67	.72	
Our community is getting less friendly ^d	381	1.49	.75	.72	
Leadership^c:					.56
My community has good informal leaders	380	1.36	.83	.46	
My community has some knowledgeable and respected people	380	1.48	.81	.46	
I know helpful organizations in my soum	380	.96	.94	.55	
The local government pays attention and listens to us	380	1.15	.85	.48	
Rules^e					.73
Rules exist to regulate the timing of grazing	72	1.28	.74	.73	
Rules exist to regulate the number of livestock	72	.29	.59	.69	
Rules exist to regulate the type of livestock	72	.22	.54	.68	
Rules exist to regulate use of hay areas	72	.56	.77	.65	
Rules exist to regulate use of wells	72	.61	.70	.69	

^a Cell entries show sample sizes from two datasets: household survey (N=382) and organization profile survey (N=77). ^b Items were coded as follows: 0 = none, 1 = some (1-3 people), and 2 = many (3+ people). ^c Items were coded as 0 "disagree," 1 "neutral," and 2 "agree." ^d Items were reverse coded as 0 "agree," 1 "neutral," and 2 "disagree." ^e Items were coded as 0 "no rules," 1 "traditional or informal rules," and 2 "formal agreed rules." ^f Cronbach alpha is a coefficient of reliability showing consistency among items within an index variable, where score greater than .65 is desirable (Vaske, 2008).

We used multiple regressions to answer the second research question "Which institutional design elements are more influential in achieving greater social outcomes for Mongolian pastoral groups?" First, we tested the effect of institutional designs on intermediate outcomes, then, on ultimate

social outcomes. The test was exploratory without clear direction of the effect. We used the following equations:

$$Y_{1-6} = i_Y + b_1(X_1) + b_2(X_2) + b_3(X_3) + b_4(X_4) + b_5(X_5) + b_6(X_6) + b_7(X_7) + \varepsilon_Y \quad (4.1)$$

where:

Y_{1-6} = six intermediate social outcome variables

i_Y = the intercept

b_{1-5} = standardized coefficients for X_{1-5}

X_{1-5} = five group attributes variables

$$Y_{1-6} = i_Y + b_1(X_1) + b_2(X_2) + b_3(X_3) + b_4(X_4) + b_5(X_5) + b_6(X_6) + b_7(X_7) + b_8(X_8) + b_9(X_9) + b_{10}(X_{10}) + \varepsilon_Y \quad (4.2)$$

where:

Y_{1-6} = six intermediate social outcome variables

i_Y = the intercept

b_{1-10} = standardized coefficient for X_{1-10}

X_{1-10} = ten institutional arrangement variables

$$Y_{1-6} = i_Y + b_1(X_1) + b_2(X_2) + b_3(X_3) + b_4(X_4) + b_5(X_5) + b_6(X_6) + b_7(X_7) + \varepsilon_Y \quad (4.3)$$

where:

Y_{1-6} = six intermediate social outcome variables

i_Y = the intercept

b_{1-5} = standardized coefficients for X_{1-5}

X_{1-5} = five external environment variables

For ultimate social outcomes we used the same equations except number of dependent variables were eight.

4.4. Results

First, we will present results of ANOVA tests comparing three group types a.k.a. donor facilitation by institutional design variables. Next, we will report the results of the multiple regressions by three sets of independent institutional design variables: group attributes, institutional arrangements and external environment. We will begin with the description of the effects on intermediate social outcomes, followed by the ultimate social outcomes.

4.4.1. Effect of group type on institutional design

4.4.1.1. Group type effects on group attributes.

We found a significant difference in four group attribute variables among the group types (Table 4.5). As expected, PUGs had a significantly larger group size, with an average of 154 members per group ($F=21.32, p<.01$). Herder groups and nukhurluls had almost three times smaller group size than PUGs having an average of 44 and 55 members, respectively. On average, PUGs had three years of group experience, which was significantly less than herder groups' and nukhurluls' (5 and 9 years respectively) experience ($F=16.07, p<.01$). We found that herder groups were significantly less diverse ($\bar{X}= .40$) in terms of members' well-being than PUGs ($\bar{X}=.58, F=6.44, p<.01$). Herder group members had higher homogeneity of interests and values than that of PUG members ($\bar{X}=1.75$ and $\bar{X}=1.49, F=5.21, p<.01$). Among these significant differences, group size, and experience had large effect sizes ($\eta^2 = .38$ and $.30$ respectively, both large³³).

³³ Eta squared is the proportion of variation in Y that is associated with membership of the different groups defined by X (Lakens, 2013). An effect size can be small ($\eta^2 \geq .01$), medium ($\eta^2 \geq .06$) and large ($\eta^2 \geq .14$) (Cohen, 1988).

4.4.1.2. Group type effects on institutional arrangements.

Internal institutional arrangements did not differ by group types except recording of groups' documents (refer to Table 4.5.) On average, PUGs and nukhurluls maintained records of 9 documents while herder groups had 6 records ($F=7.60, p<.01$). This difference had a large effect size (.18).

4.4.1.3. Group type effects on external environment.

Table 4.5 shows that the group types significantly differed in their access to training, ongoing donor support and level of market integration. Herder groups' average score of 2.39 in access to training was significantly greater than PUG's average of 1.55 ($F=5.61, p<.01$). PUG members reported a significantly higher score of available technical and financial support (1.07) compared to members of herder groups (.44, $F=5.34, p<.01$). Herder groups had significantly greater market integration with less expensive travel costs (on average, 82 km) as compared to PUG members (average of 137 km, $F=11.79, p<.01$). These differences had medium to large effect sizes: access to training and market integration had .13 or medium, while ongoing donor support had .14 or larger.

Table 4.5. Results of Comparisons of Institutional Design Variables by Group Types: Herder Groups (n=36), Pasture User Groups (PUGs, n=36) and Nukhurluls (n=8)

Institutional design variables	Sample		Herder groups ^a		PUGs ^b		Nukhurluls ^c		F	η^{2e}	
	mean	range	M	SD	M	SD	M	SD			
Group attributes	Group size	89	8-482	44	32	154	100	55	47	21.32***	.38
	Group experience	5	0-14	5	3	3	2	9	4	16.07***	.30
	Leaders' legitimacy ^d	3.3	2-4	3.41	.61	3.17	.69	3.36	.63	1.26	.03
	Heterogeneity of well-being	.47	0-.73	.40	.26	.58	.10	.39	.23	6.44***	.16
	Homogeneity of interests	1.62	.5-2.0	1.75	.29	1.49	.40	1.56	.28	5.21***	.12
	Poverty level	.11	0-.94	.11	.11	.13	.16	.09	.07	.23	.01
	Dependence on livestock	.65	.18-.91	.61	.18	.70	.11	.64	.10	2.61*	.07
Institutional arrangements	Ease of rules	2.57	1-3	2.68	.48	2.50	.64	2.29	.76	1.64	.05
	Awareness of rules	3.31	1-5	3.50	1.14	3.03	1.12	3.57	1.13	1.54	.04
	Group-devised rules	1.61	1-3	1.72	.81	1.44	.76	2.00	.89	1.77	.05
	Quality of rules	2.96	0-4	3.06	1.11	2.84	1.44	3.00	.63	.26	.01
	Presence of sanction	.50	0-1	.54	.51	.50	.51	.29	.49	.76	.02
	Leaders' meeting	3.18	1-8	2.80	2.03	3.76	1.92	2.71	2.14	2.05	.06
	Members' meeting	3.41	1-7	3.03	1.81	3.93	1.70	3.14	2.04	2.19	.06
	Meeting attendance	2.38	1-3	2.50	.66	2.21	.63	2.43	.79	1.51	.04
	Transparency	4.33	1-5	4.24	.74	4.42	1.12	4.43	.54	.37	.01
	Documents records	8	0-15	6	4	9	4	9	3	7.60***	.18
External environment	Access to training	1.99	0-3	2.39	.87	1.55	1.15	2.00	1.31	5.61***	.13
	Local government support	1.31	.2-2.6	1.36	.59	1.27	.53	1.28	.44	.24	.01
	External cooperation	1.38	0-3.	1.39	.73	1.38	.71	1.38	.92	0	0
	Ongoing donor support	.72	0-2	.44	.76	1.07	.79	.50	.84	5.34***	.14
	Market integration	107	20-230	82	28	137	56	93	69	11.79***	.24

^a Groups supported by the United Nations Development Programme, ^b Pasture User Groups supported by the Swiss Development Agency, ^c Groups supported by the New Zealand Nature Institute and Wildlife Conservation Society, ^d Variable was coded as follows: 1 = Not accepted at all, 2 = Little acceptance, 3 = Majority acceptance, 4 = Openly accepted. ^e Eta squared is the proportion of variation in Y that is associated with membership of the different groups defined by X (Lakens, 2013). An effect size can be small ($\eta^2=.01$), medium ($\eta^2=.06$) and large ($\eta^2=.14$) (Cohen, 1988).

*, ** and *** significant at 0.10, 0.05 and 0.01 respectively

Table 4.6 displays the results of comparative tests for items of index variables that significantly differed across group types. The results revealed that 75% of herder group members had access to formal knowledge exchange events compared to 33% of PUG member' ($F=6.92, p<.01$). We found the statistical difference in heterogeneity of well-being because of the difference in *average* income groups between PUGs and nukhurluls (46% vs. 73% respectively, $F=4.37, p<.05$). In other words, nukhurluls had greater number of average income households, while PUG's average income group was not large. Significantly greater percentage of PUG members stated the presence of financial (48%) and technical (62%) support of their donor compared to the percentage of herder groups reporting on this (19%, $F=3.63$ and 27%, $F=4.22$ respectively at $p<.05$).

A significantly higher percentage of PUG members reported the presence of seven different types of organizational records their group maintained as compared to herder group members. These included documents on loan repayment (94% vs. 39%, $F=15.41, p<.01$), loans taken (91% vs. 38%, $F=13.80, p<.01$), loans given (94% vs. 45%, $F=12.96, p<.01$), conflicts (30% vs. 0%, $F=8.34, p<.01$) and organization income/expenditure (79% vs. 44%, $F=5.39, p<.01$). Nukhurluls also reported good record of their activities, particularly, all nukhurluls' report on documentation of various contributions was significantly greater than herder group's responses (100% vs. 61%, $F=6.23, p<.01$).

Table 4. 6. Comparison of Items of Four Institutional Design Variables with Significant Differences among Group Types (N=77)

Group types	Herder groups ^a n=35	PUGs ^b n=33	Nukhurluls ^c n=8	F	η^{2q}
<i>Heterogeneity of well-being</i>					
Proportion of wealthy households	.13	.18	.13	.68	.02
Proportion of average households	.58	.46 ^{d***}	.73 ^{d***}	4.37**	.12
Proportion of poor households	.23	.27	.11	2.34	.07
Proportion of very poor households	.06	.08	.03	.48	.01
<i>Access to training</i>					
Members' participation in events	.89	.70	.75	2.00	.05
Organization of formal events	.75 ^{e***}	.33 ^{e***}	.50	6.92***	.16
Facilitation of informal events	.75	.52	.75	2.33	.06
<i>Ongoing donor support</i>					
Financial	.19 ^{f**}	.48 ^{f**}	.17	3.63**	.10
Technical	.27 ^{g**}	.62 ^{g**}	.33	4.22**	.12
<i>Documents records</i>					
Officer profiles	.76	.76	1.00	1.07	.03
Meeting records	.76	.88	1.00	1.65	.05
Income/expenditure of CBRM	.44 ^{h***}	.79 ^{h***}	.83	5.39***	.14
Records of contributions	.61 ^{ij***}	.91 ^{i***}	1.00 ^{j***}	6.23***	.15
Ecological monitoring	.21	.24	.14	.17	.01
Harvested hay and fodder	.39	.42	.57	.36	.01
Distributed hay and fodder	.39	.39	.43	.02	0
Livestock number	.64	.64	1.00	1.92	.05
Grazing timing and location	.27	.52	.29	2.25	.06
Rule breaking	.03 ^{k***}	.33 ^{k***}	.29	5.70***	.14
Punishment	.06	.27	.14	2.81	.07
Conflicts	0 ^l	.30 ^{lm***}	0 ^m	8.34***	.19
Loans taken	.38 ^{n***}	.91 ^{n***}	.71	13.80***	.29
Loans given	.45 ^{o***}	.94 ^{o***}	.86	12.96***	.27
Loans repayment	.39 ^{p***}	.94 ^{p***}	.71	15.41***	.31

^a Groups supported by the United Nations Development Programme, ^b Pasture User Groups supported by the Swiss Development Agency, ^c Groups supported by the New Zealand Nature Institute and Wildlife Conservation Society, ^{d-p} Means in the same row that share the same superscripts differ at $p < .01$ in the Games-Howell multiple comparison test. ^q Eta squared is the proportion of variation in Y that is associated with membership of the different groups defined by X (Lakens, 2013). An effect size can be small ($\eta^2 = .01$), medium ($\eta^2 = .06$) and large ($\eta^2 = .14$) (Cohen, 1988).

*, ** and *** significant at 0.10, 0.05 and 0.01 respectively

4.4.2. Effect of institutional design on social outcomes.

4.4.2.1.1. Effect of group attributes on intermediate social outcomes.

Group attributes had significant positive effects on all intermediate outcomes while three individual elements negatively influenced three outcomes (Table 4.7). Group attributes explained larger variations in cooperation ($R^2=.30$, $F=3.40$, $p<.01$), knowledge exchange ($R^2=.29$, $F=3.39$, $p<.01$) and income diversity ($R^2=.24$, $F=2.59$, $p<.05$). Among the group attributes, homogeneity of interests, group size, and experience significantly influenced three to four intermediate outcomes. Homogeneity of interests increased the levels of information diversity ($\beta=.35$), leadership ($\beta=.36$) and cooperation ($\beta=.29$) and rules ($\beta=.23$). Group size increased rules ($\beta=.38$) and cooperation ($\beta=.21$) but decreased income diversity ($\beta=-.33$). Group experience positively influenced income diversity ($\beta=.24$, $p<.10$), but reduced knowledge exchange and leadership ($\beta=-.42$ and $-.22$ respectively).

Four group attributes were important for cooperation: group size, leader's legitimacy, heterogeneity of well-being and homogeneity of interests. Group experience ($\beta=-.45$) and heterogeneity of well-being ($\beta=-.42$) had a negative effect on knowledge exchange. Only leader's legitimacy increased the level of knowledge exchange ($\beta=.26$, $p<.05$).

Table 4.7. Results of Multiple Regressions of Institutional Design Variables on Intermediate Social Outcomes

Dependent variables	Rules	Cooperation	Information diversity	Knowledge exchange	Income diversity	Leadership
<i>Group attributes</i>						
Group size	.38***	.21*	-.01	-.04	-.33**	.04
Group experience	.14	.18	-.13	-.45***	.24*	-.22*
Leaders' legitimacy	-.07	.23**	.11	.23**	.14	.14
Heterogeneity of well-being	.04	.25*	-.18	-.42***	.22	-.13
Homogeneity of interests	.23*	.29**	.35***	-.01	-.12	.36***
Poverty level	.25*	-.07	.17	-.02	.07	.01
Dependence on livestock	0	.15	.09	.09	-.15	.13
<i>R</i> ² , and <i>F</i>	.22/2.26**	.30/3.40***	.21/2.20**	.29/3.39***	.24/2.59**	.23/2.48**
<i>Institutional arrangements</i>						
Ease of rules	-.07	.13	.23	.01	-.29**	.05
Awareness of rules	.08	.03	-.21	.05	-.07	-.11
Group-devised rules	-.14	-.10	.18	.19	.39**	.26*
Quality of rules	.13	-.13	-.14	-.02	-.03	-.07
Presence of sanction	.30**	.45***	.32*	-.20	.07	.03
Leaders' meeting	.20	.32*	.38*	.21	.07	.34
Members' meeting	-.15	-.16	-.40**	-.08	-.19	-.13
Meeting attendance	-.33**	.02	.08	.06	.15	-.04
Transparency	-.16	-.30*	.16	.06	-.04	.10
Documents records	.39***	.35**	.03	-.02	.06	-.03
<i>R</i> ² , and <i>F</i>	.54/5.03***	.43/3.25***	.31/1.89*	.11/.52	.25/1.43	.17/.86
<i>External environment</i>						
Access to training	.46***	.42***	.25*	-.09	-.05	.05
Local government support	.18	.12	.18	.31**	.01	.37***
External cooperation	-.29**	-.15	.05	.12	-.09	0
Ongoing donor support	.37***	.16	.14	-.04	.06	-.08
Donor approach	.07	-.12	-.23	.08	-.32*	.05
Market integration	-.01	.11	.05	.08	.16	.19
<i>R</i> ² , and <i>F</i>	.36/5.59***	.23/2.98**	.21/2.63**	.16/1.85	.07/.77	.20/2.45**

*, ** and *** significant at 0.10, 0.05 and 0.01 respectively

4.4.2.1.2. Effect of institutional arrangements on intermediate social outcomes.

Institutional arrangement variables were less influential on intermediate outcomes than group attributes (Table 4.7). We found a significant effect of these variables on only three intermediate outcomes: rules ($R^2=.54$, $F=5.03$, $p<.01$), cooperation ($R^2=.43$, $F=3.25$, $p<.05$) and information diversity ($R^2=.31$, $F=1.89$, $p<.10$). Among institutional arrangements, presence of sanctions had a significant positive effect on three intermediate outcomes, rules ($\beta=.30$, $p<.05$), cooperation ($\beta=.45$, $p<.01$) and information diversity ($\beta=.32$, $p<.10$). Document records greatly increased rules ($\beta=.43$) and cooperation ($\beta=.42$) at $p<.01$. Group-devised rules improved leadership ($\beta=.26$, $p<.10$) and income diversity ($\beta=.39$, $p<.05$). Leader meeting frequency increased cooperation ($\beta=.32$, $p<.10$) and information diversity ($\beta=.38$, $p<.10$). We found a significant negative effect of institutional arrangements on four intermediate outcomes. Surprisingly, more frequent member meetings reduced information diversity ($\beta=-.40$), and attendance at these meetings had a negative association with the presence of rules ($\beta=-.33$) at $p<.05$. Good transparency negatively affected cooperation ($\beta=-.30$, $p<.10$). Easy rules reduced income diversity ($\beta=-.29$, $p<.05$).

The model strongly influenced cooperation with significant influences of four variables. Presence of sanctions, leaders' meeting frequency, and document records positively affected cooperation and negatively influenced cooperation. Presence of sanctions and document records positively influenced rules while meeting attendance reduced rules. Leader meeting frequency, presence of sanctions and ease of rules had a positive influence on information diversity.

4.4.2.1.3. Effect of external environment on intermediate social outcomes.

The external environment significantly influenced four intermediate outcomes (Table 4.7). External environment explained larger variations in rules ($R^2=.36$, $F=5.59$, $p<.01$), information diversity ($R^2=.21$, $F=2.63$, $p<.05$), and cooperation ($R^2=.23$, $F=2.98$, $p<.05$). Variables such as access to training and

local government support were most influential in increasing levels of three intermediate outcomes each. The training had a positive effect on rules ($\beta=.46, p<.01$), cooperation ($\beta=.42, p<.01$) and information diversity ($\beta=.25, p<.10$). Support of local government was essential for leadership ($\beta=.37, p<.01$) and knowledge exchange ($\beta=.31, p<.05$). We found a positive effect of ongoing donor support on rules only ($\beta=.37, p<.01$) contrary to our expectations. External cooperation had a negative influence on the rules ($\beta=-.29, p<.05$). For rules, favorable external environment included access to training and ongoing donor support.

4.4.2.2.1. Effect of group attributes on ultimate social outcomes.

Group attributes significantly affected most ultimate social outcomes except structural social capital (Table 4.8). Group attributes explained the most variation in cognitive social capital ($R^2=.40, F=5.44, p<.01$), herd size ($R^2=.31, F=3.73, p<.01$) and proactive behavior ($R^2=.23, F=2.48, p<.05$). Three design elements were more influential; dependence on livestock significantly influenced six outcomes, homogeneity of interests and leaders' legitimacy influenced four ultimate outcomes each. Essentially, dependence on livestock had a positive effect on herd size ($\beta=.33$), assets ($\beta=.33$) innovative and traditional practices ($\beta=.28$ and $.26$), and cash income ($\beta=.27$) at $p<.05$. However, it decreased the level of trust and the norms of reciprocity ($\beta=-.32, p<.05$). Homogeneity of interests increased both types of social capital: cognitive ($\beta=.39, p<.01$) and structural ($\beta=.32, p<.05$) and proactiveness ($\beta=.24, p<.10$), but negatively influenced herd size ($\beta=-.24, p<.10$). Leaders' legitimacy increased the levels of traditional practices ($\beta=.36, p<.01$), proactiveness ($\beta=.32, p<.05$), herd size ($\beta=.22, p<.10$) and cognitive social capital ($\beta=.19, p<.10$).

Table 4.8. Results of Multiple Regressions of Institutional Design Variables on Ultimate Social Outcomes

Dependent variables Independent variables	Assets	Cash income	Herd size	Social capital		Rangeland practices		Proactive behavior
				cognitive	structural	traditional	innovative	
<i>Group attributes</i>								
Group size	-.33**	.01	-.16	.12	.15	-.14	-.23*	-.10
Group experience	.15	.22	-.26**	-.05	.02	-.10	.18	-.08
Leaders' legitimacy	.15	.11	.22*	.19*	.04	.36***	.20	.32**
Heterogeneity of well-being	.04	-.06	0	-.21*	-.10	-.18	-.02	-.01
Homogeneity of interests	-.06	-.09	-.24*	.37***	.31**	-.07	.08	.24*
Poverty level	.06	-.18	-.19	-.24**	-.17	.07	.01	.05
Dependence on livestock	.33**	.25*	.33***	-.36***	.07	.26*	.28**	.21
R^2 , and F	.19/1.91*	.22/2.32**	.31/3.73***	.40/5.44***	.17/1.63	.22/2.27**	.21/2.17**	.23/2.48**
<i>Institutional arrangements</i>								
Ease of rules	.29*	.10	-.05	-.0	.06	.07	.40***	-.01
Awareness of rules	-.09	-.11	-.18	.09	.06	-.03	-.22	.06
Group-devised rules	.01	-.05	-.13	.09	.35**	.12	.23	.04
Quality of rules	-.37*	.01	-.05	.08	-.15	-.31	-.44**	-.09
Presence of sanction	.23	-.08	-.11	-.17	.08	.19	.44**	.16
Leaders' meeting	.47**	-.14	-.08	.01	.42**	.41*	.40**	.39*
Members' meeting	-.28	.21	.21	-.02	-.15	-.24	-.37**	-.43**
Meeting attendance	-.01	-.20	-.08	.30*	-.21	.01	.10	.15
Transparency	-.08	.27	.06	.26	-.02	.01	-.33**	-.07
Documents records	-.20	-.15	-.04	.04	-.01	-.03	-.13	.12
R^2 , and F	.16/.83	.18/.94	.17/.88	.22/1.22	.30/1.79*	.14/.69	.36/2.38**	.20/1.10
<i>External environment</i>								
Access to training	-.15	-.04	-.12	-.18	.26*	-.14	.05	.12
Local government support	.02	-.03	-.17	.41***	.21	.28**	.14	.36***
External cooperation	-.05	.21	.09	.01	-.04	.13	-.20*	-.03
Ongoing donor support	.15	-.04	.29**	-.13	-.23*	.14	.25*	-.05
Donor approach	-.34**	-.20	-.10	-.14	.20	-.24	-.49***	-.20
Market integration	-.18	0.22	0.04	.12	-.21	-.02	-.10	.24*
R^2 , and F	.14/1.65	.09/1.01	.13/1.44	.27/3.60*	.18/2.05*	.15/1.77	.29/4.06***	.25/3.22***

*, ** and *** significant at 0.10, 0.05 and 0.01 respectively.

Five group attributes were important for cognitive social capital: homogeneity of interests and leader's legitimacy increased it while heterogeneity of well-being ($\beta=-.30, p<.05$), poverty ($\beta=-.24, p<.05$) and dependence on livestock ($\beta=-.36, p<.01$) reduced trust and norms of reciprocity. Similarly, four group attributes influenced livestock number: dependence on livestock and leader's legitimacy increased its level while homogeneity of interests and group experience ($\beta=-.24$ and $-.26, p<.05$) decreased it. Apparently, group size reduced the level of assets ($\beta=-.33, p<.05$) and innovative practices ($\beta=-.23, p<.10$).

4.4.2.2.2. Effect of institutional arrangements on ultimate social outcomes.

Table 4.8 shows that the model had a significant fit for only two ultimate social outcomes: structural social capital ($R^2=.30, F=1.79, p<.10$) and innovative rangeland practices ($R^2=.36, F=2.38, p<.05$). Six institutional arrangement variables influenced innovative practices. Presence of sanction and leaders' meeting ($\beta=.44$ and $.40$ respectively, $p<.05$) and ease of rules ($\beta=.40, p<.01$) were favorable. However, quality of rules ($\beta=-.44$), members' meeting ($\beta=-.37$) and transparency ($\beta=-.33$) had a negative effect on innovation at $p<.05$. Leaders' meeting ($\beta=.42$) and group-devised rules ($\beta=.35$) had a positive effect on structural social capital. Among institutional arrangements, the leaders' meeting was the most influential variable increasing the levels of assets ($\beta=.47, p<.05$), structural social capital, traditional ($\beta=.41, p<.10$) and innovative rangeland practices, and proactive behavior ($\beta=.39, p<.10$). Interestingly, institutional arrangement variables had a mixed effect on innovative rangeland practices while they positively influenced structural social capital.

4.4.2.2.3. Effect of external environment on ultimate social outcomes.

External environment significantly influenced four ultimate social outcomes and had no effect on assets, cash income, herd size and traditional practices (Refer to Table 4.8). External environment

explained more variations in cognitive social capital ($R^2=.27$, $F=3.60$, $p<.10$), innovative practices ($R^2=.29$, $F=4.06$, $p<.01$) and proactiveness ($R^2=.25$, $F=3.22$, $p<.01$). Among external environment elements, local government support was the most influential with a positive effect on four ultimate outcomes: cognitive social capital ($\beta=.41$, $p<.01$), proactiveness ($\beta=.36$, $p<.01$), traditional practices ($\beta=.28$, $p<.05$). For innovative rangeland practices, ongoing donor support was favorable ($\beta=.25$, $p<.10$) while donor approach and external cooperation had a substantial negative effect ($\beta=-.49$ at $p<.01$ and $\beta=-.20$ at $p<.10$ respectively).

4.5. Discussion

4.5.1. Donor facilitation influenced group attributes and their external environment.

Group type or donor facilitation was important for shaping group attributes and the external environment of Mongolian CBRMs. However, it did not influence institutional arrangement sets. A prevailing dichotomy was shown between herder groups and PUGs in overall design. Herder groups had more of the attributes theorized to promote successful outcomes in commons institutions, such as smaller size, longer experience working together, and homogenous interests of the members. Herder groups also had greater access to training and markets. On the other hand, PUGs had three features predicted to be advantageous to group outcomes: heterogeneity of well-being, maintaining good documentation and available external assistance. We note that PUG formal records were mostly financial in nature while documents related to resource use were few.

Regarding influence on intermediate outcomes, the study confirmed that small size, group experience, and homogeneous interests are important group characteristics that predict levels of intermediate outcomes. Aligning with theory, institutional arrangements such as the presence of sanctions, group-devised rules, frequent leader meetings, and document records increased cooperation, agreed rules, and information diversity. In addition, access to training and local government support

provided a favorable external environment for these three intermediate outcomes, as well as leadership.

For ultimate social outcomes, group characteristics such as dependence on livestock, homogeneity of interests and leader legitimacy were critical for increasing social capital, livelihood, rangeland practices and proactive behavior of members. From institutional arrangement variables, leader meeting frequency was the most influential for ultimate social outcomes. Local government support and ongoing donor support increased trust and norms of reciprocity, rangeland management practices, pro-activeness, and herd size.

In terms of the second research question about influential design elements, group attributes and external environment sets were more influential determinants of social outcomes of pastoral CBRMs in Mongolia than institutional arrangement sets. Along with these theoretically supported outcomes, we found contradictory results as summarized in Table 4.9. We suspect that most of these negative influences could be associated with group size (Agrawal, 2002; Ostrom, 1990).

Table 4.9. Summary of Negative Relationships Potentially due to the Group Size

Institutional design variable with a negative effect	Affected intermediate social outcome	Group size influenced by negative effect	Affected ultimate social outcome	Group size influenced by negative effect
<i>Group Attributes</i>				
Group size	Income diversity	Large group size	Assets, innovative practice	Small size
Group experience	Knowledge exchange		Herd size	
Heterogeneity of well-being	Knowledge exchange			Small size
Homogeneity of interests			Herd size	Large size
Dependence on livestock			Cognitive social capital	
Poverty			Cognitive social capital	
<i>Institutional arrangement</i>				
Quality of rules	Information diversity	Large group size	Innovative practices	Small size
Members' meeting		Small group size	Innovative practices	Large size
Meeting attendance	Presence of rules			
Transparency	Cooperation		Innovative practices	
<i>External environment</i>				
External cooperation	Presence of rules			
Ongoing donor support	Income diversity	Large group size	Structural social capital	Large size
Donor approach				

We now move to detailed discussions of the results that address the second research question, “which institutional design elements have the greatest influence on social outcomes for Mongolian pastoral groups?” The first three sections will underline influences of each of the three sets of institutional design variables on intermediate outcomes. The remaining sections will summarize effects on ultimate social outcomes. Table 4.10 provides a summary of more influential institutional design elements on both types of social outcomes of Mongolian pastoral groups.

4.5.2. Group attributes had mixed effect on intermediate social outcomes

The set of seven group attribute variables significantly increased the levels of three intermediate social outcomes; cooperation, information diversity and rules. However, attributes such as small size, heterogeneity of well-being, and group experience had a negative influence on knowledge exchange, income diversity, and leadership. From the prior results, it is intuitive that the larger the group size, the less frequent to interact with each other and more difficult to communicate in the Mongolian pastoral setting. In terms of the negative effect of heterogeneity of well-being, it is possible that the more the groups are economically diverse, the more dissimilar their areas of interests, which may prevent knowledge exchange. Lastly, when members become more experienced working together, they do not require frequent consultation with each other unless some unexpected issues arise.

Among the group attributes, homogeneity of interests and group size had the strongest positive influence on cooperation and rules. We reported that herder groups had more favorable group designs as predicted. Hence, it is possible to conclude that the facilitation of herder groups was more effective in terms of achieving greater cooperation, information access, and rules.

Table 4.10. More Influential Institutional Design Elements for Social Outcomes of Community-Based Rangeland Management Groups in Mongolia

Favorable institutional design variable	Intermediate social outcome	Ultimate social outcome
<i>Group attributes</i>		
Leaders' legitimacy	Cooperation, knowledge exchange	Traditional practices, proactive behavior, herd size, cognitive social capital
Group size (large)	Cooperation, rules	Cognitive social capital, structural social capital, proactive behavior
Heterogeneity of well-being	Cooperation	
Homogeneity of interests	Cooperation, information diversity, leadership, rules	Assets, herd size, innovative practices, traditional practices, cash income
Dependence on livestock		
Poverty	Rules	
<i>Institutional arrangements</i>		
Ease of rules		Assets, innovative practices, Structural social capital
Group-devised rules	Leadership, income diversity	Innovative practices
Presence of sanction	Cooperation, rules, information diversity	
Documents records	Cooperation, rules	Traditional and innovative practices, proactive behavior, structural social capital
Leaders' meeting	Cooperation, information diversity	
<i>External environment</i>		
Access to training	Cooperation, rules, information diversity	Traditional practices, structural social capital
Local government support	Leadership, knowledge exchange	Proactive behavior, cognitive social capital
Ongoing donor support	Rules	Innovative practices, herd size
Market integration		Proactive behavior

4.5.3. Institutional arrangements influenced rules, cooperation and information diversity.

The set of institutional arrangements significantly influenced three out of six intermediate outcomes. The effect of individual design elements on the three intermediate outcomes was not unidirectional. For instance, the presence of sanctions, document records and group-devised rules consistently increased the levels of intermediate outcomes. The presence of sanctions was positive for cooperation and information diversity. On the other hand, the following relationships were negative: meeting attendance reduced rules, transparency was negative to cooperation, members' meeting frequency reduced information diversity. Regarding these negative relationships, here we provide our thoughts. Table 4.5 showed that more members of herder groups and nukhurluls attended meetings. We also highlighted their limitations for setting rules involving all resource users in the same geographic area due to the voluntary membership. Hence, the number shows that small sized herder groups and nukhurluls had fewer rules.

In terms of transparency, the results may signal cautious application of this concept in a small rural community setting. Prevailing understanding about transparency as being necessary for the organization management for increasing trust, legitimacy, and reputation has been concerned with higher levels of social institutions (Wehmeier & Raaz, 2012). On the other hand, many of the transparency discussions within commons institution literature have been framed by the co-management model, where transparency of planning and decision-making of state and donor organizations or local elites was imperative (Shackleton & Campbell, 2001; Thompson, 2013; Vollan, 2012). We know relatively little about the level of transparency necessary for small communities where members have intimate knowledge about each other across generations, as is the case in rural Mongolia.

Members' meeting is one source of information for CBRM groups. Hence, more frequency of meetings may reduce member's time for utilizing other information sources such as meeting experts or

talking to more experienced members. Since PUGs had frequent meetings, we speculate about possible mediation of group size for the decline of information diversity. Essential sources of information such as exchanges with technical experts and access to training are more limited for the members of larger groups. This fact may explain the negative relationship between the members' meeting and information access.

4.5.4. External environment increased the levels of four intermediate outcomes.

External environment had a greater influence on intermediate outcomes compared to the institutional arrangement variables. External environment was important for four outcomes: rules, cooperation, information diversity and leadership. Among the external environment variables, access to training and local government support were most influential. Contrary to our expectations, external cooperation and donor approach negatively influenced the presence of rules and income diversity respectively. We coded the territory approach with larger value. Hence, the result implied less income diversity for territory-based groups and more for voluntary groups. The latter had a greater access to skills training (refer to Table 4.5) thus for other income generation opportunities. Accordingly, fewer members of large territory-based groups benefited from such training due to resource and logistic constraints of the donor. The negative relationship between external cooperation and the presence of rules was puzzling as we expected positive roles of external agents for having more rules for resource use. Without examining the local context and process of setting rules, it was difficult to explain such relationship.

4.5.5. Group attributes were most influential for ultimate outcomes, but the effect was mixed.

Despite the fact that the group attribute model significantly influenced all ultimate social outcomes except structural social capital, the effect was not consistent. The results confirmed that

higher levels of dependence on resources, homogenous interests, and leader legitimacy led to more increased ultimate outcomes. However, greater homogenous interests and group experiences were negative for herd size. We reported that voluntary groups had more of these characteristics from prior discussions (Table 4.5). Unlike territory-based groups, voluntary groups had objectives for biodiversity conservation. Hence, these groups received more training and education towards decreasing competition for resources between wildlife and livestock. As compensation, voluntary groups had more skills training that resulted in significantly greater income diversification compared to territory-based groups. We discussed this earlier in relation to the negative effect of donor approach on income diversity. Correspondingly, the average score of dependence on livestock for PUGs was above the sample mean (i.e. less income diversification) while the voluntary groups' average was below the sample mean (Table 4.5). Overall, this result did not confirm our hypothesis of a positive effect of the two group attributes (homogeneity of interests and group experience) on herd size as an ultimate livelihood outcome. Nonetheless, it suggests that, with appropriate facilitation, resource users can reduce grazing pressure.

The negative effect of heterogeneity of well-being and livestock dependence on cognitive social capital was not expected. However, the negative influence of heterogeneity of well-being on knowledge exchange, discussed earlier, can help explain this relationship. The greater difference in well-being, that caused less knowledge exchange, may further reduce trust and norms of reciprocity due to dissimilar economic interests, social connections, and power. The reason that higher resource dependence leads to less trust and reciprocal norms, may be related to the group size. PUGs were more resource dependent, but their sizes were too large for necessary interactions among the members to build stronger trusts and norms of reciprocity.

4.5.6. Institutional arrangements influenced innovative practices and social networking only.

Similar to intermediate outcomes, ultimate social outcomes had a minor influence on institutional arrangements. Although the model increased structural social capital, it had an inconsistent effect on innovative rangeland practices. Among six institutional arrangement variables with a significant influence on innovative rangeland practices, three had a negative effect. These included quality of rules, members' meeting, and transparency. We detected the negative effect of rules on ultimate social outcomes in the prior analyses of relationships (Chapter 3). Small-sized voluntary groups had a higher average score for quality of rules. We suspect that for kin-related members in such small groups, rules may be less necessary. Customarily, a senior more experienced and well-respected member can lead the group while achieving the same level of cohesion as rules are designed to attain. We need to investigate further the process of setting rules and rule contents to explain the negative effect on innovations. The relationship could also be related to the limitations of small groups in coordinating resources due to the exclusiveness of neighboring herders who share the same resources. Similarly, without further examination of group meetings in terms of their content and the way of convening, it was difficult to interpret the result. As discussed earlier, frequent but inefficient meetings reduced member access to multiple sources of information. For instance, information sources such as interactions with professionals and attending training in and outside of the soum were shown to be critical for innovative practices. This may explain the negative effect of members meetings on innovative practices. In contrast, leaders meetings were consistently positive, demonstrated by increasing levels of the five ultimate social outcomes.

4.5.7. External environment influenced four ultimate social outcomes: local government support was most positive.

The influence of the external environment on ultimate social outcomes was greater³⁴ than institutional arrangements but less than group attributes. In line with the results of prior analyses (Chapters 2 and 3), external environment increased rangeland practices, behavior, and social capital, rather than livelihood measures. Local government support was the most positive, increasing trust and norms of reciprocity, traditional rangeland practices, and proactive behavior of members. The negative effect of ongoing donor support on structural social capital may be related to the group size. We measured structural social capital by reports of members for accessing various sources of help during their hardships. We suggest that the higher proportion of members benefitting from assistance from multiple sources can be easily achieved within a smaller group compared to a larger one. Consequently, in the case of PUGs having ongoing support, their structural social capital was smaller than the score of voluntary groups. Similarly, group size may also affect the unfavorable influence of donor approach on assets and innovative rangeland practices. Donor-funded equipment, as well as delivery of training, may not be accessible to each member if the group size is large.

4.6. Implications

Theory predicts more challenges for commons institutions whose resources are large-sized with unclear boundaries and unpredictable resource flow with resource users scattered over large areas (Wade, 1988). These unfavorable characteristics are representative of the Mongolian pastoral social-ecological system (Fernandez-Gimenez, 2002). In addition, socio-political transitions for the past century have further complicated commons institutions in Mongolia. Social transformations to the socialist system, then to the free market economy, negatively influenced Mongolian pastoralism, contributing to the loss

³⁴ We imply here number of significantly influencing variables within a set on ultimate social outcomes.

or erosion of essential elements of the traditional institutions (Fernandez-Gimenez, 1999, 2001; Mearns, 1996a). All these factors together manifest the level of complexities for CBRM development in Mongolia. This study, in a broader sense, contributed to the ongoing debate on institutional designs favorable for the emergence of sustainable commons institutions (Agrawal, 2002). From a narrow perspective, the study shed light on mechanisms that influence social outcomes of evolving pastoral commons institutions in Mongolia. Despite the scarcity in Mongolian pastoral systems of resource conditions that are theorized to facilitate successful commons institutions (such as small size and clear boundaries of resource and resource users), the design principles for user groups' attributes and external environment were shown to be applicable for predicting social outcomes of Mongolian pastoral institutions. The institutional arrangement set with ten elements (Table 4.5) did not demonstrate the same influence as other two sets. This may reflect the current stage of CBRM development in Mongolia, where resource governance arrangements are emerging and not necessarily the inapplicability of these factors. The results were in line with our early finding of weak rules for major resource regulations for number and types of livestock and use of wells and hay areas.

In addition to the theoretical implications, we highlight several methodological issues specific to the Mongolian pastoral context. Theorized market pressure on local resources and users can be seen as increased demand for cashmere since early 2000, which resulted in a substantial change in species composition in the national herd. Most dramatically, in 1992 goats made up 22% of the national herd, and this increased to a 43% share in 2012 (NSO, 2015). However, a prevailing view of the negative effect of goats on pastures has not been confirmed (Addison et al., 2012). In the absence of research showing a market influence on the pastoral economy, we considered the ease of market access to be an indicator of market integration of local communities. Secondly, heterogeneity as a group attribute needs to be elaborated from the socio-economic perspective of the Mongolian pastoralism. Theories defined two types of heterogeneity: of endowments and interests (Baland & Platteau, 1996; Olson, 1965; Wade,

1988)- with differing consequences for outcomes of commons institutions. While the former implied mutually beneficial exchange favorable for the resource institutions, the latter meant different economic specialization and interests of members disadvantageous for institutional outcomes. In the Mongolian pastoral context, heterogeneity incorporates both features with paralleling results in social outcomes as shown by this study. Historically, better-off members of pastoral community provided subsistence to weaker members, while the latter offered their labor assistance to wealthy individuals for dealing with large herds (Simukov, 1934; Sneath, 2003). Using well-being groups as a heterogeneity measure for Mongolian CBRMs appeared to be contextually-grounded.

The results provided a potential solution to the current disputes over the appropriate size of CBRM groups in Mongolia. The study demonstrated that for the majority of social outcomes, traditional small groups were more effective, while for cooperation and setting rules, large groups sizes were appropriate. Hence, CBRM facilitation should start from small groups (Baland & Platteau, 1996; Olson, 1965; Wade, 1988) to achieve “fast” outcomes at individual household levels including increased rangeland management practices and proactive engagement of members. During this collaborative process, members learn to participate in internal democratic processes of formulating group plans, holding meetings, recording documents and making participatory decisions. Such frequent interactions strengthen their social capital and networking and increase their group cohesion. Indeed, voluntary membership in CBRM groups allowed resource users to make their choices for social grouping, which were mostly based on traditional social units such as *khot ail* or *saakhalt ail*. This was a winning strategy for groups to start their new endeavor with members already having a necessary level of social capital and cooperation. Apart from these advantages, if successful such new initiatives set a reputation for cooperation (Baland & Platteau, 1996) they may influence risk-averse agents and encourage them to collaborate (NZNI-IPECAN, 2006). Only when groups realize limitations of small size in terms of collective action for large landscape level resources and potential livelihood enhancement, can they self-organize

into a nested system (Ostrom, 1990) by forming a PUG-like structure. External facilitation can support such self-originated group demand by encouraging cooperation at the higher level of organization and setting formal rules that govern landscape-based resources. When comprised of socially strong small groups, a landscape-based organization, inclusive of all resource users, may facilitate greater social capital and livelihood outcomes than those of small groups. Such a strategy would enable stronger collective action and sustainable pastoral institutions for more efficient resource management.

The results pointed to the need for further qualitative research on the process of rule setting and rule contents, the ways the group meetings take place and topics of discussions at the meetings to investigate the negative relationships found.

This study suggests that external facilitation for CBRM development may be necessary in the absence of access to information by mobile Mongolian communities. Following Blomquest et al. (1994), it is challenging for pastoralists to utilize institutional means for resource management due to inherent limitations of resource storage and unpredictability that, in turn, require high costs for reliable information. In the Mongolian CBRM context, external donors brought crucial information, easing the cost problems. One policy implication from these findings is that unless an appropriate system for delivering information to pastoral communities is in place, there has to be a facilitating agent, be it government, a development agency or a civil society organization. However, we caution that such facilitation has to be grounded on careful consideration of local context and needs of resource users with clear objectives for strengthening pastoral institutions rather than solving unconfirmed problems of resource degradation and resource disputes (Turner, 1999).

Along with external facilitation, the role of local government in achieving social outcomes of CBRMs has a profound policy implication. Despite the significance of local government support for pastoral institutions, it remained moderate as shown by the data. Hence, there is ample room for expanding the potential role of local government in CBRM development. As institutional design

theory recommends, the national government should not hamper local resource management institutions, and in Mongolia it does not in most cases.

CHAPTER FIVE: SYNTHESIS

This chapter presents a synthesis of the study results in light of the literature review provided in the introductory chapter. The chapter summarizes study findings with respect to research questions stated in Chapter 1 and outlines the practical, theoretical and methodological implications of these findings. The chapter concludes with recommended policy options for CBRM development in Mongolia.

5.1. Summary of Findings

This section encapsulates the findings of the entire study reported separately in Chapters 2, 3 and 4. In this summary, I highlight answers to the seven research questions stated in the introductory section. Before presenting the summary, I remind the reader of my core assumption that intermediate outcomes or output-type variables precede ultimate social outcomes in time, which has important implications for my analysis and subsequent interpretation of results. Intermediate outcomes included six factors essential for ultimate social outcomes: information diversity, leadership, knowledge exchange, presence of rules, cooperation, and income diversity. Eight ultimate social outcomes were grouped into three broad categories: (a) rangeland management practices, (b) social capital and (c) livelihood. Rangeland practices included traditional rangeland practices, innovative rangeland practices and proactive behavior. Social capital was comprised of cognitive social capital, a measure of trust and norms of reciprocity, and structural social capital, an indicator of social networking. Livelihood included cash income, per capita herd size, and household assets.

RQ1. Does CBRM increase social outcomes of pastoral groups in Mongolia? I found that formal CBRM groups had more information sources, stronger leadership, greater knowledge exchange, greater cooperation and more rules. Members of formal groups were more proactive in addressing resource

management issues and used more desired rangeland practices than traditional neighborhoods. However, the two types of groups did not differ in livelihoods measured as annual cash income and herd size per family member. Also, I found no difference in cooperation and the presence of rules between the two types of groups in the desert steppe. There was a weak difference in both social capital types, assets and income diversity, with CBRM members having greater social capital and more income sources. Based on these findings, I concluded that CBRM increased all intermediate outcomes (excluding cooperation and rules in the desert steppe) and six ultimate social outcomes, all except cash income and herd size.

RQ2. Next, I asked if formal organization and six intermediate social outcomes including information diversity, knowledge exchange, leadership, cooperation, income diversity, and the presence of rules can predict increased ultimate social outcomes of pastoral groups given different ecological zones. (Non-significant livelihood variables: cash income and herd size, were dropped from the analysis). The model predicted increased proactive behavior, traditional and innovative rangeland management practices, and cognitive social capital with some variations among ecological zones. The model weakly influenced social networking (structural social capital) and assets where income diversity negatively influenced social networking. I concluded that the eight-variable model can predict an increase in four ultimate social outcomes: proactive behavior, traditional and innovative rangeland management practices and cognitive social capital.

RQ3, 4, 5. Next, I explored how and why social outcomes of CBRM groups differ from those of traditional (non-CBRM) groups in similar social, political and environmental contexts. In order to fully respond to this broad question, first, I asked whether four intermediate variables, critical for ultimate social outcomes were causally associated (QR4). These variables were information diversity, knowledge exchange, leadership and the presence of rules. The results revealed two important findings. First, the four intermediate variables were significantly associated with one another. Second, there was a

sequential order among them. I found that information diversity had a triggering effect on other three variables creating an ordered chain of information diversity → leadership → knowledge exchange → the presence of rules.

Next, the analysis revealed a mediation effect of the four intermediate variables on four ultimate social outcomes. In other words, the effect of formal organization on four ultimate social outcomes including traditional and innovative rangeland practices, proactive behavior, and social networking was positively facilitated by the four intermediate variables. This shows that formal organization alone is not sufficient to increase pastoralists' use of traditional and innovative practices, their proactive behavior or their social networking.

Further, I asked how ecological zone influences this mediated relationship between formal organization and four ultimate social outcomes (RQ5). I found that ecological zone moderated the effect of formal organization on members' proactive behavior and their social networking mediated by leadership and rules. In other words, the strength of the mediation effect of two intermediate variables on two ultimate social outcomes, proactive behavior and social networking, depended on the ecological zone. The mediating effect of rules on proactive behavior was stronger in the desert steppe while it was weaker in the steppe. The mediating effect of leadership on social networking was weaker in the eastern steppe than in non-eastern steppe zones.

These findings guided my response to Research Question 3 as follows. Ultimate social outcomes of CBRM and non-CBRM groups differed due to three major factors: formal organization, four intermediate outcomes, and ecological zone.

RQ6. I then asked how donor facilitation approaches influence the institutional design of CBRM in Mongolia. I found that donor facilitation was significantly associated with CBRM group attributes and their external environment, but had no differing effect on internal institutional arrangements and rules. I found a difference by donor facilitation type in the following group attributes: group size, group

experience of cooperation, the level of well-being heterogeneity in the group, and the homogeneity of interests or group cohesion. In terms of CBRM groups' external environment, donor facilitation was associated with availability of training, continuity of donor support, and level of market integration.

RQ7. Lastly, I sought to identify which institutional design elements were most influential in achieving greater social outcomes of Mongolian CBRM groups, considering all intermediate and ultimate outcomes. With respect to intermediate outcomes, I found that three group characteristics, namely, small size, homogeneous interests, and heterogeneity of well-being, positively influenced information diversity, leadership, and income diversity. Institutional arrangements including the presence of sanctions, group-devised rules, frequent group meetings, and recording group documents increased cooperation, agreed rules, and information diversity. Similarly, external environment variables including availability of training and local government support positively influenced the levels of cooperation, the presence of rules, knowledge exchange, leadership, and information diversity.

Regarding ultimate social outcomes, dependence on livestock, homogeneity of interests and leader legitimacy were critical group attributes for increasing social capital, livelihoods, rangeland practices, and proactive behavior. Among institutional arrangement variables, frequent meetings of leaders were the most influential for ultimate social outcomes, increasing social networking, both types of rangeland practices, proactive behavior and assets. Among external environment variables, local government support and ongoing donor support were associated with increased trust and norms of reciprocity, rangeland management practices, proactiveness, and herd size. Overall, group attributes and external environment factors were more influential determinants of CBRM social outcomes than institutional arrangements. From these findings I draw two conclusions. First, among the three sets of theorized institutional design principles, group attributes and external environment variables were most important for achieving greater social outcomes. Donor facilitation approach had a significant association with these two sets of variables. Second, when I examined individual design elements, the

most influential were: group characteristics of homogeneity of interests, dependence on livestock, and leader's legitimacy; institutional arrangements including frequent leaders' meetings and the presence of sanctions; and external environment including available training and local government support. These findings provide an empirical basis for study implications described in the following section.

5.2. Study Implications

The above findings enable me to describe the status of Mongolian CBRM at the edge of the first decade of the 21st century in comparison to the outcomes reported internationally. In subsequent sections, I summarize theoretical, methodological and practical implications of my study.

5.2.1. CBRM status in post-socialist Mongolia

This broad-scale assessment across 142 groups in 36 soums and four ecological zones leads to a conclusion that the initial process of CBRM development since 1999 has been positive in Mongolia. In my sample, there was no evidence of diminished social outcomes compared to traditional neighborhoods, or the wide-spread negative consequences as reported in other rangeland regions of the world (Balint & Mashinya, 2006; Cleaver, 2005).

To varying degrees in different ecological zones, CBRM has clearly contributed to increasing proven traditional rangeland management practices, learning and applying new innovative practices, and shifting pastoralists' passive dependent position of waiting guidance from the top (Muller & Bold, 1996) to more proactive constructive behavior in rangeland matters.

CBRM has facilitated reemergence of local cooperation and trust among households and between herders and the local government, which were reported lacking prior to CBRM (Baival, 2012; Upton, 2008), and strengthening traditional norms of reciprocity. However, group-level outcomes that require collective efforts at the inter-household level are slower to achieve than outcomes at the

member household levels. This trend may confirm Ostrom's conclusion that it takes a learning process when a greater number of members involved in the resource management to interact frequently, cooperate and exchange to build a rigorous resource institution.

Pastoral groups were able to attain increased social outcomes by accessing diverse information and exchanging knowledge, under strong local leadership supported by donor programs. In contrast, traditional groups showed lower levels of social outcomes, highlighting the significance of these factors for attaining increased social outcomes.

The external support of bringing training and education, encouraging learning and local leadership strongly influenced the changes in practices and behavior of CBRM members. In contrast to results in other regions of the globe where externally-facilitated knowledge has not always been favorable (Kellert et al., 2000; Ruiz-Mallen & Corbera, 2013), in Mongolia external facilitation has led to the increase in outcomes.

Although CBRM did not succeed in improving well-being of members in terms of their income and livestock holdings, livelihoods were maintained at levels similar to non-CBRM households. Some studies of CBRM in Africa reported worsening livelihoods due to corruption, elite capture, or increased costs of conservation (Saito-Jensen et al., 2010; Satria et al., 2006; Suich, 2010). In the Mongolian context, it appears that there are limitations for CBRM to substantially influence livelihood outcomes. Sales of cashmere and live animals, and government support payments that comprise 68% of the total annual income of an average herder household (see Chapter 1) largely depend on market prices and government revenue. These factors are beyond the influence of CBRM programs. CBRM may have some potential to diversify household income sources by facilitating non-livestock income generation, including vegetable growing, souvenir making or providing seasonal services to tourism operators, as reported by Leisher et al. (2012). However, these income sources are supplementary and not every CBRM group has the necessary conditions for these types of income generation.

5.2.2. Theoretical implications

This study made contributions to theories of the commons in several ways. Results of the study show that CBNRM can be an effective strategy to address the common pool resource (CPR) dilemma. Social outcomes of CBRM in Mongolia contribute most to addressing provision problems. When pastoralists increase their traditional rangeland management practices such as setting aside winter and spring pastures, or dzud reserves, or digging a new well³⁵, they avoid overexploiting resources. Practices such as culling unproductive animals reduces grazing pressure, and cutting hay and preparing hand fodder, store resources and lessen future appropriation problems (Schlager et al., 1994). These strategies ultimately should help to maintain resource conditions. Similarly, many innovative practices contribute to sustaining local resources, namely, fencing pastures³⁶, hay areas and water sources, and taking actions to protect key resources. These practices are exercised not only at the household level but also at the group level by increasing their cooperation and coordination of timing of grazing, and use of wells and hay areas. Such collective action requires proactive behavior of individual members who actively raise issues for discussion and seek for solutions to sustain resources.

My findings also contribute to the debate about what makes CPR institutions successful. These results are in agreement with previous research that the information, leadership, communication and exchange and agreeing on rules among resource users are preconditions of successful CPR institutions (Baland & Platteau, 1996; Ostrom, 1990). In addition, treating these intermediate variables as output-type factors distinct from ultimate social outcomes proves to be theoretically essential. This distinction depicts the existing relationships among different contributing factors, which I will elaborate later.

³⁵ I consider digging a new well can open access to unused pastures while releasing grazing pressures in more crowded areas in Mongolia. Although it is possible that creating too many wells can facilitate overgrazing.

³⁶ Temporary fencing of small patches of critical resources for conservation purposes that some CBRM groups practiced is considered here. The author acknowledges the negative consequences of permanent fencing of pastures in the pastoral context (Galvin et al., 2008).

Further, this study deepened our understanding of how resource characteristics shape commons institutions. The significant influence of ecological zones on social outcomes of pastoral groups accords with the major theoretical claim for the importance of resource characteristics on institutional outcomes (Agrawal, 2002; Niamir-Fuller & Turner, 1999). Commons theory predicts better outcomes of commons institutions in resource-rich areas such as steppe and eastern steppe with relatively stable and predictable production. In contrast, successful collective action and resulting outcomes are anticipated to be more challenging in areas with unpredictable patchy production such as the desert steppe (Schlager et al., 1994). Our findings showed differences among ecological zones, potentially associated with their resource characteristics. However, in contrast to predictions, we observed more proactive behavior and social networking among desert steppe CBRM members. Further, more proactive behavior and social networking among herders in the harsher desert steppe environment were in line with our prior findings of higher levels of reciprocal norms and mutual assistance in the desert steppe groups (Chapter 3). Overall, our findings suggest that the mixed conclusions about CBRM reported by past studies may be explained in part by failure to consider mediating and moderating factors and the sequential order of intermediate variables during the CBRM implementation.

From the institutional design perspective, my results support the assertion that attributes of resource user groups and their external environment play a significant role in institutional outcomes. Small group size, homogeneous interests among group members, strong leadership and dependence on resources were influential in achieving social outcomes of CPR institutions in Mongolia. Among the theorized external environment factors, external aid and access to learning and education are in line with the institutional design theory (Agrawal, 2002; Baland & Platteau, 1996).

An important empirical contribution to the commons theory might be my findings about underlying associations (1) among factors facilitating desired social outcomes of CBRM and (2) between these intermediary factors, formal organization of resource users and their social outcomes. These

results fall into the category of research investigating conditions for successful CPR institutions (Agrawal, 2014; Ostrom, 2008). The sequential order of information delivery → local leadership → knowledge exchange → setting rules can be tested in other field settings. However, in our study, this result was possible in the context of strong participatory facilitation of external agencies. Second, the findings show that information diversity, leadership, knowledge exchange and the presence of rules explain how formal organizations of resource users achieve ultimate outcomes including rangeland management practices, proactive behavior, and social networking among users. Among these outcomes, proactive behavior and social networking vary with ecological zone.

These theoretical contributions have a solid methodological foundation that addressed major gaps in studies of the commons using larger samples of comparative cases while investigating underlying aspects of factors contributing to CPR institutional sustainability (Agrawal, 2002; Poteete & Ostrom, 2008). The study also enriched the current studies of pastoral commons, which have a limited scope in the overall CPR literature.

5.2.3. Methodological implications

This study showed the applicability of statistical causal models to analyze CBRM in pastoral social-ecological systems. In addition, I tested the institutional design model of emerging commons institutions for Mongolian CBRM groups. Operationalization of several social variables in the Mongolian pastoral context may provide a useful basis for further studies.

In this study, I used two statistical models known to test causal relationships involving the effect of third variable: mediation and moderation tests (Hayes, 2013; Wu & Zumbo, 2008). Although these tests are frequently used in psychological studies (Hayes, 2009), their recent applications in the human dimensions of natural resource management inspired me to use them to understand social outcomes of commons institutions. Social outcomes of CPR institutions also include cognitive and behavioral aspects

of resource users towards local resources and their strategies for efficient resource use. My application of these models shows their applicability for testing indirect effects on already established relationships between the formal organization and social outcomes of CPR institutions. Particularly, in the pastoral context, intermediate outcome variables demonstrated a good fit for mediators while ecological zone had a classic moderator function. In addition, PROCESS software of Dr. Hayes (Hayes, 2013) provided a powerful statistical tool for conducting these tests. The software had two key advantages: it can be added to SPSS with similar application tabs where independent, dependent, mediator and moderator variables can be inserted. For statistical tests, the software uses bootstrapping procedures that release normality requirements of parametric statistics. However, it had three limitations for my study. First, the number of serial-multiple mediators in a model was limited to four variables only, which forced me to eliminate two intermediate outcomes. Second, a moderator has to be either a continuous or dichotomous variable. Hence, I had to recode my categorical ecological zone variable into four different dichotomous variables. Lastly, the serial-multiple mediator model did not allow simultaneous testing of moderator effect. For this reason, I had to use a parallel-mediator model for testing a moderation effect of ecological zone on four ultimate social outcomes including two types of rangeland practices, proactive behavior and structural social capital (social networking).

I also tested the applicability of the institutional design model for predicting social outcomes of Mongolian pastoral institutions. I excluded the set of resource characteristics variables from the original four-set model suggested by Agrawal (2002) due to my research goal for examining social outcomes. The results show that the two out of three sets of institutional design elements, namely group attributes and external environment models well predicted social outcomes of CBRM in Mongolia. I mentioned earlier specific design elements influential for both types of social outcomes. The fact that the set of institutional arrangement variables did not influence social outcomes may be related to two factors: (1) the current early stage of CBRM development where rules and internal governance are rather weak and

(2) the possibility that generally rules have to be loose and flexible due to unique culture embedded in the pastoral institutions.

The division of social outcomes into two types was shown to be an empirically-grounded method for measuring social outcomes of externally-driven CBRM institutions. Intermediate and ultimate social outcomes have different timing and complexity to achieve following the formal organization of groups: pastoral groups achieved intermediate outcomes sooner than ultimate outcomes. Institutional design elements have differing influence on the two types of social outcomes though some design elements affected both types. For instance, small size, homogeneous interests and heterogeneity of well-being were important for intermediate outcomes, but for achieving ultimate social outcomes two design elements, namely, leader's legitimacy and homogeneity of interests were most influential.

Operationalization of two institutional design variables including market integration and heterogeneity of endowments, required grounding in the Mongolian pastoral context. In Mongolia, theorized market pressure on local resources and users can be seen as increased demand for cashmere since early 2000, which resulted in a substantial change in species composition in the national herd. Most dramatically, in 1992 goats made up 22% of the national herd, and this increased to a 43% share in 2012 (NSO, 2015). However, a prevailing view of the negative effect of goats on pastures has not been confirmed (Addison et al., 2012). In the absence of research showing a market influence on the pastoral economy, we considered the ease of market access to be an indicator of the market integration of local communities.

Secondly, heterogeneity as a group attribute needs to be elaborated from the socio-economic perspective of the Mongolian pastoralism. Theories defined two types of heterogeneity: of endowments and interests (Baland & Platteau, 1996; Olson, 1965; Wade, 1988)- with differing consequences for outcomes of commons institutions. While the former implied mutually beneficial exchange favorable for

the resource institutions, the latter meant different economic specialization and interests of members disadvantageous for institutional outcomes. In the Mongolian pastoral context, heterogeneity incorporates both features with parallel results in social outcomes as shown by this study. Historically, better-off members of the pastoral community provided subsistence to poorer members, while the latter offered their labor assistance to wealthy individuals for dealing with large herds (Simukov, 1934; Sneath, 2003). Using well-being groups as a heterogeneity measure for Mongolian CBRMs appeared to be contextually-grounded.

5.2.4. Practical and policy implications

This study has a number of practical implications that provide policy options for CBRM development in Mongolia. First, the results largely support the benefits of formal CBNRM organizations for achieving social outcomes, especially, reviving traditional practices, introducing adaptive innovations in rangeland management, encouraging proactive behavior and social networking of pastoralists (Fernandez-Gimenez et al., 2014; Leisher et al., 2012). As argued above, these social outcomes facilitate addressing provision problems of CPR management. Hence, my findings provide sufficient ground for further policy advancement for supporting CBRM in Mongolia.

Eight conceptually-grounded factors, namely, formal organization, ecological zone and six intermediate variables including information, leadership, knowledge exchange, rules, cooperation and income diversity, are important to attaining greater social outcomes. We learned that without intermediate variables, the formal organization of resource users alone is not sufficient to achieve social outcomes. Importantly, access to information triggers a sequential chain of mediation by encouraging local leadership and fostering knowledge exchange among community members that prepares them for setting collective rules for resource management. Practically, these results provide research-based

guidance for CBRM facilitation and policy back-up by investing in these contributing intermediate outcomes.

In Mongolian CBRM, external donors have substantial power in shaping the attributes of the groups they support as well as groups' external environment. The donors decide on group size, influence the diversity of members by requiring inclusion of poor households, and affect group cohesion by encouraging them to act collectively. By facilitating groups' relationship with local government and external professionals, and helping to market their products, the donors facilitate a positive context for newly evolving groups. Hence, external facilitation agency has a determining role in emerging CPR institutions as well as shaping power relations and social equality in local settings. Such position, in turn, requires high professionalism and competence in both theoretical understanding of CPR issues, and specifics of Mongolian pastoralism.

Theory suggests that group size is important to emerging commons institutions (Ostrom, 1990; Wade, 1988). In the context of Mongolian CBRM, small sized groups had greater group cohesion and longer cooperation experience, and ease of accessing information and training than large groups. However, small size was disadvantageous for addressing larger scale coordination to address provision problems. As shown, large sized groups had a higher level of cooperation and more rules but were not as effective as small size groups in attaining outcomes. These findings support the appropriateness of a theorized nested structure of institutions (Ostrom, 1990). Also, the actual group size discussed in this study is Mongolia-specific. Large size implies an average of 156 individuals or 39 households while a small group has an average of 44 individuals or 11 families. Hence, Mongolian "large" is much smaller than the 15,000 appropriators Ostrom refers to (1990, p. 182).

Most findings were in line with the theorized relationships among contributing factors for emerging CPR institutions except a few Mongolia-specific phenomena. For instance, added variables to the design principles model including frequent meetings of group members and their leaders, recording

group formal documents, local government support, and availability of donor's assistance were vital for achieving CBRM social outcomes. The importance of these factors to groups may also indicate the current dependence of pastoralists on outside guidance and their acknowledgment of groups' collective action. In other words, groups' strong reliance on the support of local government, donor assistance, and their leaders points to the fact of weak ownership of local groups.

I suggest that social outcomes such as proactive behavior of individual members and their daily resource use practices are "fast" variables, which are "building blocks" for fostering trust and norms of reciprocity and social networking among members. Trust and norms of reciprocity are at the heart of commons institutions to overcome inherent "social dilemmas" and require broader interactions beyond household and kin relationships. Without high levels of trust and strong norms of reciprocity, it is difficult to achieve more complex social and ecological outcomes such as improved livelihoods and better resource conditions. Hence, in the pastoral context, the pace of progress seems to be important. The groups in this study had an average of the five-year experience of collective action and could achieve outcomes related to daily rangeland practices and self-mobilization for contributing to rangeland matters. More time and experience may be required to achieve greater levels of social capital and well-being.

5.3. Conclusions and Recommendations

I note that this assessment did not cover outcomes of CBNRM in a broader sense including other resources, which may have different results. Hence, conclusions and recommendations follow, relate specifically to rangeland management in Mongolia.

The last decade of CBRM development in Mongolia has shown a healthy progress with promising initial results. External donors initiating CBRM have applied appropriate facilitation, encouraging local resource users' participation and acknowledging their knowledge about local

resources and strategies that best fit their environment. The donors have played a catalyzing role by filling governance gaps brought by rapid political and economic reforms, especially in improving herders' access to information, opportunities for collective learning, and forums for discussion of local issues. This increased communication and interaction has helped overcome distrust. The donor-supported programs have also funded most costs for supporting CBRM with minor input from the government and resource users. Many of the donor-facilitated CBRM practices have shown to be well-grounded in the Mongolian social-ecological systems thus require acknowledgment and replication. A few other strategies such as determining group size for supporting CBRM organization and sequence, pace and length of facilitation need some adjustments as highlighted in the prior section.

Despite prevailing increase in social outcomes, the current progress of CBRM has rather limited scope bounded by available resources of donors. For instance, voluntary groups of herder groups and nukhurluls could reach about 20% of their respective soum pastoral population. Pasture User Groups with a mandatory membership, covering almost entire soum herder population currently are present in 126 soums or 37% of all rural counties in Mongolia.

The central government has remained rather reserved in relation to CBRM. Importantly, the government accepted initial suggestions to experiment CBRM (Agriteam-Canada, 1997) and let donors implement their programs in various regions of the country as they choose. In a later stage, the government endorsed policies supporting CBNRM development including two orders of the Environment Minister (GoM, 2006, 2010b) and additions to the Law of Environmental Protection and the Government Livestock Sector Development Program (GoM, 2010a). Thanks to the latter, soum government obtained three additional government officers responsible for rangeland management. The reserved position of the central government may be positive without excessive intervening of local CBRM decisions. However, a theoretically required legal recognition of pastoral resource users as a

resource management organization (Ostrom et al., 1994) remained absent (Dulamsuren et al., 2011; Fernandez-Gimenez et al., 2014).

Regarding CBRM institutional status, the formal organization of resource users have attained initial changes in their behavior and attitudes through increased education and awareness of necessary sustainable resource management. CBRM institutions are in the process of strengthening their social capital and cooperation preparing for a larger scale goal for livelihood improvement. However, a major issue appears to be their weak ownership of management and organizational matters, particularly, in relation to rules. Such weak ownership could be also associated with the lack of a need for strong resource regulation. If a resource is relatively abundant with no conflict over it, there is no dilemma and no need for strict resource regulations. Equally, it is possible that formal rules threaten informal social norms as shown by other research in Mongolia (Addison, 2012) and elsewhere (Arnold & Fernandez-Gimenez, 2007; Cleaver, 2002).

These concluding remarks lead us to suggest following policy options for furthering CBRM development in Mongolia.

CBRM in Mongolia must be scaled out to fulfill its promise in addressing CPR dilemmas. Lessons learned from this study can be reflected in several strategies of CBRM development. The current practice of donor site selection has not been effective in ensuring strong ownership of resource users and in identifying dilemma situation. Ideally, those local users facing resource overuse and conflicts should self-organize and seek external support for solving their issues. If resource users are satisfied with the current situation and do not see big problems or conflicts, they can continue relying on customary norms currently practiced. To initiate change, the central government needs to adopt a Law on CBRM with a clear definition of CBRM organization, their rights, and responsibilities over communal management of local resources, and relationships with other stakeholders. One of their rights should be the right to access donor/government financial and technical support in the face of resource-related

conflicts and threat of overuse. Within this legal environment, donors can support those groups already self-organized but which need external support to solve their problems.

Under this strategy, the available donor resources can be used for national level education and training programs. Considering the fact that over 80% of herder households possess TV and radio, there is great potential for herder- and soum government staff-targeted education and training programs using mass-media outlets. To motivate self-organization of resource users, persistent and substantial amounts of education and training, sharing local successes or lessons, participants' reflections need to be broadcast.

A further process of CBRM facilitation can replicate best practices shown to be effective for the last decade with inherent participatory facilitation and processes. Consideration of supplying intermediate outcomes first by their order should be an essential element of CBRM facilitation. A plan for a nested structure in the future while starting from small groups compatible with the traditional social organization has to be in the mind of external facilitators.

Finally, this study calls for a further qualitative inquiry to elucidate why rules have a negative effect on social outcomes of pastoral groups. Particularly, the process of rule setting and rule contents, and assessing rules potential for addressing CPR dilemma require further examination. A closer investigation of specific governance processes within community groups and their local context in different ecological zones would help explain differing levels of social outcomes across four ecological regions. Further, a qualitative inquiry is necessary to determine whether elite capture is occurring and to address issues of power dynamics within CBRM groups.

Globally, the promising case of CBRM in Mongolia may encourage mobile pastoral communities elsewhere to cooperate on the sustainable management of their resources. However, as the study showed, careful facilitation is needed to achieve intermediate outcomes, and consideration of the distinct dynamics of local resource systems is necessary to attain increased social outcomes.

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APPENDIX

Table 1.1. Summary of CBRM Study in Mongolia and Key Findings

Source: author, year, title	Examined variables	Research question	Method and survey instrument	Study site, sample size	Key results
1) Upton 2008 Social capital, collective action and group formation: Developmental trajectories in post-socialist Mongolia	Group formation, trust, collective action livelihoods, role of third party in facilitating collective action, social capital and group formation, issue of longer term access to resource and equity	The role of individuals, contextual characteristics and third parties in facilitating collective action, social capital and group formation Longitudinal evaluation of trust, collective action and cooperation between CBRM and non-CBRM	Qualitative: Household survey In-depth key informant Interview of herders Follow-up semi-structured interviews Oral histories	Desert steppe, Umnugovi 2000-2004 111 CBRM/72 non-CBRM 102 CBRM households/67 non-CBRM 105 CBRM households 9 herders CBRM 4 non-CBRM GTZ/NZNI ³⁷ project site	No wealth and age difference between CBRM and non-CBRM members Wealthier, more remote households and those with more labor force did not join CBRM. Group of 33 was too large and failed. Access to labor was the key incentive for joining CBRM Bonding social capital strengthened. Increased organized cooperation. Access to training and peer learning increased. Exclusion of others for accessing membership, improved water sources and some delineated management areas. Third party had a catalytic role in facilitating face-to-face interaction, building trust not only among member herders but with local government
2) Fernandez-Gimenez et al. 2008 Implementing Mongolia's Land	Social capital: cognitive and structural types, knowledge, attitude, mobility,	Role of CBRM groups in land law implementation regarding pasture possession rights	Mixed method:	Steppe and mountain steppe, forest steppe zones 5 soums of Tuv,	Overall reported conflict over resources was low. More conflicts reported in mountain steppe zone. Compared to non-CBRM herders, CBRM members were more mobile

³⁷ German Technical Cooperation Agency project implemented by New Zealand Nature Institute 1995-2006

<p>Law: Progress and Issues. Final Report to the Central Asian Legal Exchange</p>	<p>management practices</p>	<p>Factors influencing CBRM organization for obtaining pasture possession and management rights</p>	<p>Semi-structured interviews Household survey Document review</p>	<p>Uvurkhangai, Arkhangai and Selenge 36 informants 70 households 33 CBRM 37 non-CBRM SDC and UNDP project sites</p>	<p>and more likely to use desirable management practices: going for otor, reserving winter and spring pastures. They had slightly better knowledge about land law provisions. More CBRM herders belonged to various local associations and had more sources for obtaining help. More herders of CBRM perceived honesty among the group members than non-CBRM herders. The level of trustworthiness and mutual assistance did not differ. Study highlighted two weaknesses of small herder groups: 1) potential for elite capture, 2) mismatch between social and spatial boundaries to effectively manage resources; Weaknesses of large pasture user groups included 1) high transaction costs for communication and management, 2) weak ownership/participation of herders Herder organizations are capable of planning and managing their pastures and obtaining high level of compliance from their members. The study highlighted the conflicting nature of exclusivity for tenure security with mobility and flexibility of pastoral systems. It reported that herders and local government officials preferred flexibility and mobility over tenure security.</p>
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<p>3) Upton 2009</p> <p>“Custom” and contestation: Land reform in post-socialist Mongolia</p>	<p>Land rights, land use</p>	<p>Influence of CBRM on systems of land rights and use with potential implications for inequality and exclusion</p> <p>Longitudinal study of property rights in relation to state and customary rights and practices, potential of community-led land reform</p>	<p>Qualitative:</p> <p>Household surveys</p> <p>Follow-up semi-structured interviews</p> <p>In-depth key informant interview</p> <p>Oral histories</p> <p>Participant observation</p>	<p>Forest steppe, Arkhangai, Tariat: desert steppe, Umnugovi, Bulgan: 2000-2004</p> <p>183 desert/67 forest steppe 183/67 households</p> <p>Herders</p> <p>Government officials/project staffs</p> <p>GTZ/NZNI and WBSLP³⁸ sites</p>	<p>1 CBRM group contracted pastures for 15 years in nearby project area</p> <p>Growing sense of exclusion from membership/hardening social boundaries</p> <p>More exclusions from summer pastures around a water source improved by CBRM donor</p> <p>3 WBSLP-facilitated NGOs had contracts in 2004 for 5 years.</p> <p>Increasing concerns over access rights to resources</p> <p>Warning for need to consider implication for livelihoods and equity of non-members and existing power structures</p>
<p>4) Usukh et al. 2010</p> <p>Fostering the sustainable livelihoods of herders in Mongolia via collective action</p>	<p>Herding practices, group formation for collective action, livelihoods, management arrangements</p>	<p>If PUG 1) improves livelihoods, pasture condition, livestock productivity; 2) provides an effective framework for rangeland management</p>	<p>Qualitative:</p> <p>Semi-structured interviews</p> <p>Household interviews</p>	<p>2009-2010</p> <p>4 ecological zones: mountain, forest steppe, steppe, and desert steppe; 22 soums in 9 aimags;</p> <p>Four donor project sites: SDC, WBSLH, UNDP, IFAD RPRP</p>	<p>PUGs have greater potential for rangeland management than herder groups. Larger structures better for pasture management and mobility</p> <p>Difficult to run organization without supporting agency, strong leadership and support of local government</p> <p>Setting boundaries difficult</p> <p>Collective management is not efficient in desert steppe: less collective action, controlling livestock number is more problematic.</p> <p>Conflict over access to pasture between members/non-members</p>

³⁸ World Bank Sustainable Livelihoods project

					<p>The more years of group operation the greater is frequency of collective action.</p> <p>Leadership and good relationship with local government increases sustainability of PUGs.</p> <p>Common weaknesses were financial sustainability, relationships with non-members and marketing of products.</p> <p>Seasonal movements outside soum are more problematic than within soum.</p> <p>Coordination of movements at soum/aimag levels is needed.</p>
<p>5) Upton 2011</p> <p>Managing Mongolia's commons: Land reforms, social contexts, and institutional change</p>	<p>Member household characteristics, pasture use and rights, cooperation, collective action, mutual assistance pastoral institutions, design principles</p>	<p>The nature, impact and limitations of state-led and community-led donor-supported tenure reforms and social innovations with respect to land rights, and practices</p> <p>Comparative study of non-CBRM/CTZ/WB/UNDP project groups</p>	<p>Qualitative:</p> <p>Household surveys</p> <p>Follow-up semi-structured interviews</p> <p>In-depth key informant interview</p> <p>Oral histories</p> <p>Participant observation</p>	<p>3 sites 2000-2008: GTZ/NZNI/WBSLP /UNDP project sites</p>	<p>Low conflict among non-CBRM groups; equity and compliance with rules in use better, no evidence of open access situation.</p> <p>Some CBRM groups had contracts for 15 years in UNDP site.</p> <p>Little understanding of those contracts among the CBRM members</p> <p>Concerns among non-members over potential limits to their mobility.</p> <p>Confirmed prior findings of hardening social boundaries for accessing CBRM membership by non-members.</p> <p>Declining mobility and access to pastures by non-members apparent.</p> <p>Exclusion of non-members from pasture use and haymaking areas</p> <p>These contracts were ineffective in the face of ninja mining incursions.</p> <p>Compulsory group membership has not proved effective. They were more</p>

					like paper groups although seemingly addresses the issue of exclusion. It does not address intragroup dynamics, power relations and ensure equity in resource access. Herder group's capacity is weak. Legislative provision is vague.
6) Murphy 2011 Going on otor: Disaster, mobility, and the political ecology of vulnerability in Uguumur, Mongolia	Equality, power relations, livelihoods land access	Effect of donor- supported cooperative program on local power relations for resource access and livelihood	Qualitative: Ethnography	Khentii, IFAD RPRP site 8 cooperatives	Major incentives for joining cooperatives were well contract with operating rights, registering customary campsites, obtaining possession contracts, other opportunities for vegetable farming and hay-cutting, acquiring tractor for large-scale farming. For senior wealthy herders these were means to cement their control over wells and pasture territories with exclusive rights. Program failed in reducing poverty and improving environmental condition. Increased inequality among community members making poor herder more vulnerable. Only wealthy and powerful members benefited from it. The program also failed in other goals of labor distribution, and risk management. The program supported territorial exclusion and deepened disparities by formalizing rights of powerful members.
7) Baival et al.	Resilience	Comparing	Qualitative:	2008-2009	About 20% of Jinst soum herders

<p>2011 A case study of community-based rangeland management in Jinst soum, Mongolia In book edited by Fernandez-Gimenez et al. "Restoring community connections to the land: Building resilience through community based rangeland management in China and Mongolia"</p>	<p>capacity building, knowledge, attitudes, communication networks, inclusiveness, diversity, rangeland management practices governance Vegetation</p>	<p>resilience among CBRM and non-CBRM herders Assess social, ecological and economic outcomes of CBRM</p>	<p>Interviews Focus groups Observations Document review</p>	<p>Jinst CBRM soum, and Bayantsagaan non-CBRM soum in Bayankhongor 21 informants 4 with 75 people UNDP site</p>	<p>involved in CBRM project. CBRM members had more communication networks with greater interaction with outsiders and other groups, and had higher leadership qualities than non-CBRM herders. CBRM members had greater access to training, which allowed their interaction and mutual exchange that encouraged their innovation for resource management. Interacting with diverse people helped CBRM herders to increase their social capital. After the project end, CBRM members' collective action fell slightly. Only a small number of people benefitted from project support in Jinst.</p>
<p>8) Dulamsuren et al. 2011 Lessons from a territory-based community development approach in Mongolia: Ikhtamir Pasture User Groups In book edited by Fernandez-Gimenez et al. "Restoring</p>	<p>Well-being, pasture management practices, Vegetation: foliar cover, basal cover and basal gaps</p>	<p>Evaluate performance of two CBRM groups</p>	<p>Mixed method Semi-structured interviews Household surveys</p>	<p>Two PUG in Ikhtamir, Arkhangai 5 informants 39 households: 21:18</p>	<p>PUGs learned a new important practice of fencing off hay-cutting fields with potential for reducing vulnerability of members. New innovation of revolving funds was the key for supporting other grassland management activities such as fencing, digging water sources, purchasing new equipment, and income generation. PUGs showed potential for better use of pasture, and cooperation among herders, contributed to decrease in poverty rate in Ikhtamir soum. The study highlighted the importance</p>

community connections to the land: Building resilience through community based rangeland management in China and Mongolia”					of constant update of rules adjusting to new requirements. PUG’s rules set up at the time of group formation remained without update created occasional conflicts among different PUGs. Particularly, setting boundary with full participation of all herders was stated to be significant. It also emphasized a need for a legal structure for PUGs nationwide.
9) Upton 2012 Adaptive capacity and institutional evolution in contemporary pastoral societies	Adaptive capacity Mobility, diversification, communal pooling, storage, market exchange, institutional facilitation	Role of donor-initiated programs on adaptive capacities and strategies of pastoralists	Qualitative: Grounded theory approach Household survey In-depth key informant Interview of herders Follow-up semi-structured interviews Oral histories	Desert steppe, Umnugovi 2000-2009 111 CBRM/72 non-CBRM 102 CBRM households/67 non-CBRM 105 CBRM households 9 herders CBRM 4 non-CBRM GTZ/NZNI ³⁹ and WB SLP project site	No donor-supported group effect in mobility. Observed exclusion around a mechanical well repaired by donor support. CBRM supported income diversification in the form of vegetable growing but it ceased to non-existence due to large supply at the market. CBRM were more effective in communal pooling of their labor and marketing their livestock products. In emergency times, members preferred kin networks rather than nukhurlul network as some go for otor which weakened communal pooling. No CBRM effect in storage activities. CBRM members had better economies of scale accessing more distant markets with better prices but that ceased with the end of project. CBRM group resilience had limitations. Many activities ceased with the end of

³⁹ German Technical Cooperation Agency project implemented by New Zealand Nature Institute 1995-2006

					the project, and members turned back to their traditional reliance. CBRM has shaped adaptive strategies for members.
10) Baival 2012 Community-based rangeland management and social-ecological resilience of rural Mongolian communities	Diversity and redundancy of SES, knowledge, ability for re-organization and renewal Social and ecological outcomes, process outcomes and outputs	Explore the range of social and ecological diversity among CBRM herders and non-CBRM Assess whether CBRM communities differ from non-CBRM communities in their capacity to implement diversity enhancing practices	Qualitative: Interviews Focus groups Observation Document review	2008-2009 mountain steppe and desert steppe 2 CBRM soums (Jinst, Khujirt) and 2 non-CBRM (Bayantsagaan, Kharkhorin) in 2 aimags: Uvurkhangai, Bayankhongor 8 groups 32 informants 36 people UNDP site	CBRM facilitated management of key resources, encouraged proven traditional practices improved knowledge and social capital of members. CBRM influenced local government's rangeland management planning also at national level facilitated formulation/adoption of a new Livestock Program in 2010. CBRM was engaged at 3 levels of cooperation: household/khot ail (3-5), group level (5-20) and territorial cooperation (20-50). After the project end some groups ceased their activities. Reported a sense of exclusion and competition among herders.
11) Leisher et al. 2012 Measuring the impacts of community-based grasslands management in Mongolia's Gobi	Productivity of grazing areas, income, livestock management, pasture management,	Comparative study of outcomes of CBRM versus non-CBRM	Mixed method: Remote sensing NDVI data Household interviews Focus groups Key informant interviews	Desert steppe Umnugovi 6 soums June-July 2010 280 households 8 31 GTZ/NZNI site	CBRM sites generated 11% more biomass on average than non-CBRM 12% greater median income of CBRM households and other social outcomes. 18% greater average income of CBRM households. More income from value added items and non-livestock sources. More assets owned by CBRM members including TV, satellite dish and car/truck. More members reserve winter

					pastures. Role of women increased: active participation, skills development, Key to success included community-driven approach, knowledge exchanges and strong community leadership, facilitation of soum staff
12) Fernandez-Gimenez et al. 2012 Cross-boundary and cross-level dynamics increase vulnerability to severe winter disasters (dzud) in Mongolia	Vulnerability, adaptive capacity, resilience	Role of local institutions in mitigating and responding to dzud; Assess herder household and community vulnerability adaptive capacity, recovery from dzud Identifying factors associated with household and community vulnerability, adaptive capacity, resilience	Mixed method Interviews: Government officials Project officers Community leaders Focus groups Household survey	Mountain steppe Desert steppe 2 CBRM soums: Ikhtamir and Jinst 2 non-CBRM soums: Undur-Ulaan and Bayantsagaan 11 informants 16 persons 3 persons 6 with 91 people 94 households: 60 CBRM 34 non-CBRM Sites of UNDP and SDC projects	Cross-boundary and cross-level dynamics (hoofed dzud, inadequate aid procedures) can contribute to vulnerability of herders. Local stakeholders have an opportunity to learn from dzud and reflect learning into their actions. However, this process in turn depends on strong cross-level institutions to coordinate mobility, development of livestock market and value-added processing. CBRM groups were more likely to be better prepared for winter, more proactive, had greater collective action thus had less loss from dzud. CBRM has potential to strengthening adaptive capacity and resilience of pastoral groups.
13) Addison et al. 2013 Do pasture user groups lead to improved rangeland	Rangeland management, cooperation, exclusion, sanctions	How institutions and activities of CBRM groups affect rangeland condition	Mixed method: Herder interviews Household	Desert steppe in Dundgovi and Umnugovi 2009-2010 25/25 CBRM/non-CBRM 10 steppe-type	Groups were inactive in the sites. Few activities were present. Reported existence of spatial boundaries but exclusion was not enforced as perceived by herders. Dzud influenced disengaging with CBRM activities.

<p>condition in the Mongolian Gobi desert?</p>				<p>(PUG) and 15 Gobi-type (nukhurluls)</p> <p>GTZ/NZNI and SDC sites</p>	<p>CBRM was viewed as unsuitable for desert areas. No deliberate control to prevent encroachment of livestock to others grazing areas. CBRM was viewed more beneficial in terms of livelihood rather than regulation of pasture access. Steppe-type PUG had better rangeland condition but little evidence that CBRM institutionally improved rangeland condition. Improvement may be due to non-institutional factors (irrigation for fodder production or wealth of members).</p>
<p>14) Baival&Fernandez -Gimenez, 2012</p> <p>Meaningful learning for resilience-building among Mongolian pastoralists</p>	<p>Knowledge, adaptive capacity, resilience, access to information, leadership, cooperation</p>	<p>How the resilience of pastoral communities is influenced by ability to combine different knowledge types?</p>	<p>Qualitative:</p> <p>In-person interviews Focus groups Observation Document review</p>	<p>mountain steppe and desert steppe 2 CBRM soums (Jinst, Khujirt) and 2 non-CBRM soums (Bayantsagaan, Kharkhorin) in Uvurkhangai, Bayankhongor 2008-2010 8 groups 39 informants</p> <p>9</p> <p>UNDP site</p>	<p>CBRM members' knowledge increased and applied that knowledge into their practices. Knowledge integration occurred in response to critical events like dzud and drought. These included expert knowledge of pasture management, donor knowledge about effective community organization, local government cooperation and local rules. Non-CBRM members wanted to have their own organization but lacked leadership, access to information how to do that. Both group types shared 1) strong traditional knowledge, practices and institutions for rangeland</p>

					<p>management; 2) knowledge and leadership of local government present in both types, 3) reciprocal information and experience sharing was part of mutual support system</p> <p>More similarities than differences were found.</p> <p>Major differences included diversity of knowledge sources, processes of knowledge integration and resulting adaptive capacity.</p> <p>CBRMs had all five types of knowledge. Non-CBRM lacked expert and donor innovative knowledge.</p> <p>More diverse network for knowledge exchange among CBRM members. CBRMs lacked facilitation and leadership for knowledge exchange.</p>
<p>15) Fernandez-Gimenez et al. 2014</p> <p>Lessons from the dzud: Community-based rangeland management increases the adaptive capacity of Mongolian herders to winter disasters</p>	<p>Pasture condition, Adaptive capacity, vulnerability, mobility, storage, Access to information, social capital, rangeland practices, leadership, proactiveness, knowledge exchange, income diversity</p>	<p>Role of CBRM in responding and adapting to disaster</p> <p>Comparative study before/after dzud</p>	<p>Mixed method:</p> <p>Interviews: government staff Project staff Community leaders Focus groups/ participants</p>	<p>2 soums in mountain steppe, Arkhangai; 2 soums in desert steppe, Bayankhongor 2009-2010 2011/2012 18 groups</p> <p>11 16 3 6 groups /91</p>	<p>CBRM facilitates implementation of adaptive strategies that reduce vulnerability to dzud.</p> <p>CBRM members were more likely to go for otor.</p> <p>Resource pooling was much greater among CBRM members.</p> <p>CBRM members had more income diversification skills.</p> <p>More access to information and knowledge exchange among CBRM groups.</p> <p>CBRM members were more likely to monitor pastures and take actions to protect pastures.</p> <p>The local government played an</p>

			Household survey	94 SDC (13 groups) and UNDP (6 groups) sites	<p>important role in helping herders to respond to dzud.</p> <p>CBRM members were better prepared for winter, more innovative with higher adaptive capacities.</p> <p>These were explained by greater access to information, opportunity for knowledge exchange, and social networking.</p> <p>No difference found in structural social capital, income diversity and livelihoods, but Small difference in trust.</p> <p>Lack of sustained financial and technical support may limit CBRM to scale up further for increasing adaptive capacity.</p>
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