Factors that Contribute to Participation in Common Property Resource Management, The Case of Chobe Enclave and Ghanzi/Kgalagadi, Botswana

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Abstract

This paper studies the determinants of participation in common property resource (CPR) management activities, and in particular the effect of heterogeneity on incentives for individuals to participate in groups that provide some shared economic benefits. We are especially interested in whether and how much the degree of heterogeneity in communities influences the level of participation in CPR management. We address such questions as: Is participation in CPR management higher or lower in more heterogeneous communities? When inequality increases, is it the 'poor' or the 'rich' who drop out of the common property regimes? Does this depend on the type of group access rules? The literature on CPR management highlights the physical and technical characteristics of the resource, the characteristics of the group of users, and the attributes of institutional arrangements as key factors affecting the management capacity of local organisations. Using survey data from Chobe Enclave and Ghanzi/Kgalagadi areas of Botswana, we conclude that, after controlling for many individual characteristics, participation in CPR management is significantly lower in more unequal and in more racially or ethnically fragmented localities. The findings suggest that income inequality and racial and ethnic heterogeneity reduce the propensity to participate CPR management. We also conclude that those individuals with lower social status are less likely to participate in common property management the more racially heterogeneous their community is. These results are consistent with our model of participation in CPR management.

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1. Introduction

Common property resource management entails co-operation with a view to ensuring sustainable management of resources for the benefit of all community members. The existence of social capital; networks and norms of reciprocity, facilitates common property management by providing the social relationships and trust upon which rules and monitoring can be based. Membership in a group managing a CPR is typically conferred by membership of some other group whose primary purpose is not the management of the resource per se, such as kinship organisations, residence-based or other interest groups or clubs. Often clubs have been treated as synonymous with coalitions of agents providing congestable and excludable public goods for their members (Coleman, 1990). We observe, however, that clubs engage in a variety of activities. These activities may or may not require input of private goods. For example, the goods provided by the club may include enjoyment of the company of the other club members. In clubs of intellectuals, the exchange of ideas may be the aspect of the club that brings enjoyment to its members. Other clubs offer some goods and/or services to the general public. Some sorts of clubs offer private goods and/or services to their members in addition to public goods. There is frequently no requirement that members of the same club consume the same bundles of goods. Shared goods such as common pool resources easily fall in line with a club model.

Many observers, including economists, are convinced of the importance of the complex stock of social norms, trust, and networks of civic engagement that have been grouped under the term 'social capital' as the main predictor of participation in group activities. As forcefully argued by Putnam (1993, 1995) social capital may produce several positive socio-economic effects which can spur economic success. But, what determines social capital? This paper shows that there is something systematic about the relationship between heterogeneity of communities (ethnic and income) and the level of social capital: more homogeneous communities have a higher level of participation in social interactions leading to more social capital. Ethnic heterogeneity and income inequality vary greatly in

different countries and, through their effect on social capital, they may influence economic outcomes and public policies. One of the common criticisms of the notion of social capital is that it is very hard to 'measure', and so difficult to use in empirical analysis. Rather than focusing on a broad index of social capital, we study a critical component of it which can be measured fairly precisely, namely the participation in CPR related activities, such as conservation trust committees, regiment activities, village development committee meetings, and so on. Putnam (1993) who suggests that these types of social interaction are particularly conducive to generating beneficial effects of social capital, motivates our interest in these activities. More specifically, participation in social groups may lead to the transmission of knowledge, increases in aggregate human capital, and the development of 'trust', which all improve the functioning of markets. In addition, social interactions and networks may influence individual outcomes. Also, participation in groups is known to be highly correlated with political participation, and the latter has critical implications for policy choices. If the wealthy or more educated have a disproportionate propensity to join groups and engage in political action, then public policies may be tilted in their favour. This may lead to vicious circles, in which disadvantaged minorities participate less, have less 'voice' and become even more disadvantaged, leading to a variety of social problems.

What are predictors of participation in clubs or groups with respect to CPR management? Ostrom's (1990) work is valuable for understanding some aspects group dynamics and co-operative action in resource conservation. Her work has identified the underlying factors that contribute to the many examples of both historical and contemporary traditional regimes, which have been long-enduring and successful. The level of dependence, social heterogeneity, the size of the user group, government support, effective leadership and market or infrastructure are identified as predictors of participation in CPR management. As these are not conditions that can be created easily, because the factors are not easy to alter within the framework of resource management, they provide only limited insight into how new interventions or policies could support CPRs in less advantageous conditions (Jodha, 1990). In our model, we demonstrate that individuals prefer to interact with others who are similar to themselves in terms of

income, race or ethnicity. If preferences are correlated to these characteristics, then our assumption is equivalent to saying that individuals prefer to join groups composed of people with preferences similar to their own. Given this set up, one may expect that preferences for homogeneity may decrease total participation in a mixed group if fragmentation increases. However, individuals may choose to sort into homogeneous groups. Therefore, it is not clear a priori under which conditions more heterogeneity in a community would lead to more or less participation. In the theoretical part of the paper we investigate this issue. Our model departs from standard club theory, since our groups do not require contributions, do not have congestion effects and are based on free entry and exit of individuals. We make these assumptions because we want to focus on how the composition of the group affects individual choices of participation.

2.The Model

Participation in resource use and collective action institutions is econometrically viewed as a series of explanatory variables with participation in management of common property resources being a dependent variable. A comparative analysis between two institutional settings in two regions of Botswana demonstrates the importance of empowering people in managing CPRs. There is a clear role for the state, which is to facilitate the people's activities and to motivate their participation. The fieldwork was carried out in about 20 villages spread across the Chobe and Ghanzi/Kgalagadi districts of Botswana. The data set that is analysed with two techniques. A factor analysis is performed on ten participatory indicators of each household. In each institutional setting, social indicators turn out to be the main consideration in participation. Economic indicators follow as the second most important consideration. A regression analysis is carried out using the primary data to test theories associated with the different indicators of co-operation in CPR management. In this study, a common property resource index (CRPI) will be used as proxy for participation in common property resource management. It is hypothesised that the level of dependence, social heterogeneity, the size of the user group, government support, effective leadership and market or infrastructure are predictors of participation in CPR management.

2.1 Index of Participation in CPR Management (CPRI)

The CPRI is constructed out of a set of observable variables, all highly correlated with one another and all weighted by a single factor when examined using the multidimensional methodology of factor analysis. This procedure is a statistical approach used to analyse interrelations of variables and to explain these variables in terms of their common underlying dimensions (factors). The approach involves finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions with a minimum loss of information. There are various types of factor analysis, among them principal component analysis. This method provides a unique solution so that the original underlying variable can be constructed from the results. It looks at total variation among variables, so that the solution generated will include as many factors as there are variables, although it is unlikely that they will all meet the

criteria of retention (Tucker et al., 1997). The basic premise that underlies factor analysis is this: if there are multiple items in a survey that can be argued to reflect a theoretical construct and if those items are correlated with one another, then factor analysis will compute one score (factor score) to represent the multiple indicators. The weight each individual item is given in the factor score depends on the strength of its association with the other items. Put simply, factor analysis abstracts what the items have in common.

Each observed variable (y) is expressed as a weighted composite of a set of latent variables (f's) such that

$$y_i = a_{i1}f_i + a_{i2}f_2 + \ldots + a_{ik}f_k + e_i \tag{1}$$

Where yi is the ith observed variable on factors and ei the residual of yi on factors. Given the assumption that the residuals are not correlated across observed variables, the correlation among observed variables is accounted for by factors. Once a factor score has been extracted for a construct, subsequent analyses uses that single number instead of the several component items, which makes the analyses much more manageable than if we were to use the several items. It is in this sense, that factor analysis is referred to as a data reduction mechanism.

The limitation with factor analysis is that the factor scores reflect the theoretical construct only to the extent that the items we chose reflect the construct. If the individual items selected do not reflect the construct, neither will the factor score. But, if there is agreement on items that reasonably capture (even if not perfectly) the construct, then a factor score is considered to be a more reliable measure of the construct than any single item (Gorsuch, 1983).

The factor scores used in the regression analysis assess the extent to which constructs are integrated with each other. Regression analysis allows us to estimate the impact that one construct, say level of participation or collective action has on the CPR management construct, as well as after we have held constant or controlled for other constructs. For

example, with respect to this paper, the interest is finding out whether those community members who are dependent on a CPR are also the ones who value participation in conservation of the CPR. We regress the participation construct (the dependent variable) on the dependency construct (the independent variable). The regression coefficients give us an estimate of the extent to which the values of the dependent construct will change for every unit change in the independent variable. The Beta coefficient represents this change in standard deviation units. Further, if one wants to identify the conditions under which the association between dependence and participation in conservation of CPR is obtained, if it is possible to control for the other conditions.

The following variables are used for the factor analysis:

Quantity of Work (QW): Percentage of activities in which a household participates in support of common resource management:
1. Formation of village trust committees or user group committees
2. Community escort guides training
3. Community land use plans
4. Income generation projects in village
5. Joint partnership initiatives

If a household participated in two of these activities, then the score is 20%, and if it participated in all activities score is 100%. The high score on this variable will indicate the extent of institutional development and co-operation in managing a CPR.

Quality of Protection (QP): The extent to which members observe rules undertaken towards regulating use of resources:
1. Participation in the community resource monitoring programme
2. Observation of harvesting regulations (for grapple, wildlife and thatch grass)
3. Applying social sanctions on those who violate rules

Support for Collective Action (SCA). Number of days spent by members participating in the past year in *Kgotla* meetings and village development committee meetings.

Voluntary Action (VA): Average time spent by village members in the past year on conservation activities that include:

1.Time spent on conservation trust meetings

2.Time spent on fire fighting and building fire breaks

3.Time spent on other community activities

Support for Policy Change (SPC): Percentage of policy changes that a household member agrees with:

1.Introduce grazing fees

2. Wild life quota system

3. Introduce access fees for veld products

Although this element represents a more subjective assessment compared to other measures, it reflects village members' willingness to conserve resources through limiting their own user rights.

Principal component analysis (PCA) is using as a data reduction method for reducing the number of variables into fewer variables. The question then is, how many factors does the researcher wants to extract? As consecutive factors are extracted, they account for less and less variability. The decision of when to stop extracting factors basically depends on when there is only very little "random" variability left. The nature of this decision is arbitrary; however, various guidelines have been developed, and they are discussed in reviewing the PCA.

The CPRI is constructed by taking a sum of scores over the items mentioned above, after first standardising them by scoring the values so that each has a maximum range of one.

Each variable therefore has an equal weight within the index. With the items forming the CPRI, a household could score a maximum of five points only if it ranked top in each category.

2.2 Testing Hypotheses Relating to the Regression Coefficients

In this section we estimate the relationship between level participation in CPR management and its predictors. For our specification, we assume that at any point in time, the variable measuring the level of participation in a CPR management can be modelled as:

$$CPRI = \alpha + \beta_1 LIV + \beta_2 OPRSH + \beta_3 PVTSH + \beta_4 CPRSH + \beta_5 PUBSH + \beta_6 FMSZ + \beta_7 ETHN + \beta_8 DOMT + \beta_9 HSZ + \beta_{10} EDU + \beta_{11} SEX + \beta_{12} GST + \beta_{13} INFR + \varepsilon$$

Where

CPRI	Index for participation in common property resource management
α	Constant
β$_i$	Regression coefficients, (measure of the linear relationship between CPRI and predictors when the influences of the other independent variables are held constant. They are explained as follows;
LIV	Number of livestock units or measure of wealth
OPRSH	Own produce share of household income
PTVSH	Remittance or private transfers share of household income
CISH	Common property resource share of household income
PUBSH	Public transfers share of household income
FMSZ	Farm size in hectares
ETHN	Ethnic status of the household in terms of study area ranking of the tribe
DOMT	Membership of a dominant tribe
HHZ	Household size
EDU	Years of schooling of respondent
SEX	Gender of the respondent
GST	Government support through extension and policy provisions
INFR	Infrastructure for access to markets
ε	Error term

The regression coefficients give insights on the effects of independent variables but do not provide insights on effects of multiple presumed causes working in combination. The study is not designed to examine these respective multiple causes in detail, so we assess

what is considered to be the best available measures of these factors that could influence common property resource management outcomes.

1. Relative Level of Dependence

Collective action is assumed to prevail in situations in which people benefit from working together. In developing countries, rural communities are highly dependent on natural resources such as forests, wildlife, etc. Harnessing community potential for collective action to manage such resources is sensible, as a highly dependent on a common resource is likely to manage the resource in a more sustainable way. The following variables are used to assess the level of dependence:

Livestock Units (LIV)

This variable measures the pressure of animal population upon available grazing land. Where that pressure is greater, the rewards from employing sustainable resource management are be greater. Although animals of different sizes have different feed requirements, in this study a cow; horse or donkey is equivalent to one livestock unit whereas four goats or sheep are equivalent to one livestock unit. According to the relative level of dependence hypothesis, the greater the population pressure on the grazing land, the more likely villagers are to enforce their common property rights and exclude outsiders. On the other hand, livestock ownership represents some form of wealth. It is likely that those who own large numbers of livestock will have no interest in co-operating in managing communal grazing lands. This is reinforced by the fact that the majority of power-holders in Botswana are cattle owners as wealth is often viewed in terms of livestock holding. The relevance of this hypothesis will also be examined by looking at distribution of livestock ownership in a given village. It is more likely that the richer households control the larger numbers of livestock. The coefficient of this variable may have ambiguous effect on CPRI.

Share of CPR Income in Household Income (CISH)

The level of dependence on the CPR is a very difficult variable to compute because of multiple use dimension of CPRs. Households use CPRs for consumptive as well as non-consumptive uses. The latter is easier to measure even though it is difficult to come up with standard units of measurement across uses. For instance, firewood is measured in bundles and the number of animals grazed on the land measures fodder. To work around this problem, the level of dependence on the common is measured by share of CPR income in household income (CISH) in the past year. This was done by converting quantifiable commodities harvested from the commons into cash. For commodities that are commercialised, national prices were used and for the rest of the commodities local prices were used for such conversion. Then percentage share of income from CPR in household income was used as a proxy for household dependence on a common resource:

CISH =0 means the household is completely independent of the resource, thus will have no interest in its management. Any government policy that excludes the household or community a zero level of dependence on the resource will pose no problem. The resource in this case can be managed under state or private regime. This implies that these regimes by definition have no co-ordination costs.

CISH=1 means a household is directly dependent on the resource for its subsistence. This high level of dependence by a household will lead to high participation level of a household in collective action. It will be in the interest of the household to insure that the common resource is managed in a sustainable manner. If government introduces a policy that excludes a highly dependent household from the resource, such exclusion may become prohibitively expensive or impossible. A good example of this situation is areas that are declared protected areas. However, given government's lack of capacity to enforce rules and regulation, such resource often end up managed under CPR and in the extreme cases becomes open access. The policing or exclusion costs will increase with the dependence level of the community on the resource. Lower levels of community dependence on the resource imply lower exclusion costs. Assuming that heterogeneity is also low, this raises the relative effectiveness of the CPR. Although privatisation of the

resource under this situation is viable, it will not be as cost effective as the case of a CPR. Therefore CISH is expected to be positively associated with CPRI.

2. Wealth, Asset Ownership and Own Income

What are the likely effects of wealth on the level of participation in CPR management? Levels of heterogeneity in terms of wealth, occupation and others, are used more assess their effects on the level of co-operation. Wealth and income have been found to be associated with a household's capacity to participate in common resource management (Grootaert, 1998). The argument made in support of this finding is that households that are relatively richer will have less interest in participating in the management of a common pool resource because it is more likely to be less dependent on the resource. That is, households with more diversified sources of income or with exit options are likely not to co-operate or defect in resource management. Poorer households are likely to be associated with high levels of participation in management of a CPR while high levels of wealth are therefore associated with lower levels of CPRI. Farm size (FMRSZ), number of livestock owned (LIV), and share of own produce in household income (OPRSH) is used as indicators of wealth.

Farm Size (FMSZ)

It is hypothesised that access to private arable land reduces dependence on common property resources. The bigger the farm (hectares), the more likely that a household would be able to meet household food needs and hence use the common land less for consumptive purposes. According to the relative level of dependence hypothesis, households with bigger farms will have a lower level of dependence on common land. Therefore, farm size is expected to be inversely related to CPRI.

Own Produce Share of Household Income

This includes mainly private income from either employment, income-generating activities such as beer brewing. The higher the share of own produce to household

income, the less the gains of co-operation. OPRSH is expected to be inversely associated with CPRI.

3. Social Heterogeneity

The relationship between the degree of social heterogeneity and success in collective action is often assumed to be negative. As heterogeneity increases, the chances of reaching a consensus and hence smooth and effective CPR fails (Ahuja, 1998; Baland and Platteau, 1995). More homogeneous communities are expected to be successful in collective action because the costs of reaching a consensus are lower than in highly heterogeneous communities. Two variables are used here as measures of social heterogeneity.

Tribes (ETHN)

Ethnicity (ETHN) reflects the tribe that a household belongs to. Households from less prominent tribes should face more challenges in participating in collective action, as it would not be easier put across their views. Those from dominant tribes are likely to freely participate in CPR management because they will not be hindered by their ethnic status. Generally it is not easier to reach an agreement between people with different cultural backgrounds and possibly different languages. It is even more difficult for community members whose tribes are considered inferior to air their views freely. A good example is the *Basarwa* who are socially considered to be of low status. Their participation is not only hindered by language but also but social standing. During focus group discussions, people were asked to rank tribes according to social status in their area. Hence ethnicity here is used as a measure of social status. Each household was given a ranking according this social status. Households which belong to tribes which are considered to be of lower status face more challenges to collective action as it is not be easier to fully participate in collective action. Therefore, it is hypothesised that there is a negative relationship between ethnicity and CPRI.

Dominant Tribe (DOM)

DOM is a dummy variable, which represents whether a household is from a numerically large tribe or ethnic group. To determine to what extent the community is heterogeneous, a proportion of households belonging to a numerically large group can easily be computed. If the proportion is equal to 1 the community is considered to be highly homogeneous, hence there is good chance of leadership. In this case, the information in question and the views will be almost identical, and costs will also be low. According to Ostrom (1997), the contract or the rule system designed by the community for management of the resource has certain incentives or compatible and enforceable. The design of the contract mainly involves incorporation of economic incentives and enforcement procedures appropriate to the particular community, and it requires discussion with members in order to identify incentives and procedures acceptable to the whole community (Ostrom, 1990; Kant et al., 1998; Ostrom, 1997). The cost of this exercise will increase with community heterogeneity. For example, if the proportion is equal to 0.7 so that only 30% of the people disagree on how to manage the resource, reaching consensus and developing a system, which is incentive, compatible and enforceable will have lower costs. The probability that some members will not adhere to the rules and regulation of the system is lower. A less stronger enforcement system will be required, leading to lower enforcement costs and possibly lower physical output levels.

If the proportion of membership of a numerically large group is equal to 0, the community is extremely heterogeneous, that is, no dominant tribe. In this case, the collection and analysis of information and consensus building on the resource management will also be more costly. As heterogeneity increases, the chances of reaching a consensus and hence smooth and effective CPR fails. If government introduces a policy that requires collective action, then privatisation of such a resource will not pose any high exclusion costs. Even in the case of high dependence, exclusion will be easier as people will be acting as individuals rather than a group given the diversity involved. The higher this proportion is, the easier it should be to mobilise collective action because there is a

dominant group to take leadership. It is hypothesised that higher values of CPRI should be positively associated with membership of a numerically large group (DOM)

4. Household Size

Much literature discussing capabilities of collective action assumes that a smaller group is effective because it is by definition more homogeneous than large groups. However, smaller groups are not necessarily homogeneous. The literature on common property resources emphases that the larger the group or community, the more sub-optimal is the equilibrium (Ostrom, 1990; Runge, 1994, Ahuja, 1998). The underlying argument for this theory is that community members are rational and self-interested people. As the group size increase, each member's share of the gains from managing common property resources declines, which in turn weakens the incentives to co-operate. While community or group size might be one of the factors which increases problems of collective action, participation or co-operation in CPR management also depends on the opportunity cost of the time of the community members. People may be unable to afford the high transaction or compliance costs of participating in common property resource conservation, most importantly the time involved in attending meetings and carrying out conservation-related activities. In poorer regions, at times of stress, where people pursue multiple and continuous strategies in order to generate sufficient food and income, community members may be unable to afford the time to participate in community conservation activities, unless they can directly compensate for productive activities foregone. Household size has more direct bearing on the capacity of a household to participate in CPR management. A household with a large number of members is more likely to participate in the management of a CPR because they have a sufficient number of persons to spread across household income generating activities. Therefore, household size is considered a more relevant variable to use than group size. Household size is expected to be positively association with CPRI.

5. Education and Literacy (EDU)

Education is measured by the number of years of schooling of the respondent, and is hypothesised to significantly affect participation in CPR management. Education is important in explaining the inter-household variation in participation in management of common pool resources. Education may increase awareness of opportunities for CPR management and the ability of individuals to organise (Meinzen-Dick 1997; Bebbington et al. 1994; Esman and Uphoff, 1984). In developing countries, especially Botswana, it has been argued that education is by itself the most important variable for economic as well as human development (UNDP, 1997). Where a high proportion of a community is literate (compared to a moderate percentage as in the less literate communities in the sample), this may indicate less heterogeneity in terms of wealth or social status. This may favour collective action as argued by many authors (Ostrom 1990; Bardhan 1993). On the other hand, education may increase the awareness of exit options of community members and thus tend to undermine collective action. More educated people may have higher opportunity costs of their time, so they may be less prone to participate in collective action. Thus the net impact of education is theoretically ambiguous.

6. Government Support

Experiences have shown that centralised top-down biodiversity conservation is only effective with large expenditures on enforcement. As an alternative, participation of different types of stakeholders is now considered to be essential for effective and sustainable management and conservation of biodiversity. It is generally accepted that participation by local communities can be fostered by a significant degree of decentralisation and a conducive policy environment. Conducive policies have the potential to encourage the evolution of community-based institutions to manage natural resources locally. The propensity of individuals to organise themselves into institutions for collective action will be partly determined by the expected pay-offs.

The concept of government support is captured through the presence of government policies which promote CPR management, as well as the presence of government extension offices and other external organisations in the village. On one hand, such organisations may be catalysts for participation in local organisational development and help to strengthen the capacity of local organisations (Farrington and Bebbington 1993; Esman and Uphoff 1984; Ostrom 1990; Thomas-Slayter 1992). On the other hand, such external influences may compete with or undermine local organisations, by reducing the need for local collective action (Thomas-Slayter 1992; Thomas-Slayter 1994)

In the case of Botswana, Government, especially the Department of Wildlife and National Parks (DWNP), initiated most of community-based natural resource management programmes in the study area. The Wildlife National Conservation Act of 1992, made provision for communities to be involved in sustainable utilisation and management of wildlife as well as other resources. Government staff provided technical support to user groups in order to facilitate benefits from the policy provisions. Although it is difficult to measure the calibre of government staff directly, a measure of government staff interaction with the user groups, reflecting motivation and mobilisation, gives a good indication of extent of government support for CPR management. The extent to which people get government support in the form of extension was measured in the form of yes or no, and the results were used to arrive at a single government support variable (GST). This variable is expected to be positively related to CPRI.

7. Modernisation

Modernisation is expected to be closely associated with the existence of both norms and networks that facilitate collective action (Krishma et al, 1999). It is expected to promote the emergence of values and attitudes that facilitate co-operation and social associations. The converse of this hypothesis is that more traditional communities and societies would be more likely to act collectively. Village level modernisation is closely linked with access to market, mechanisation of production and better infrastructural facilities, especially roads, enable access to markets. The following variables are used to assess the relationship between modernisation and CPRI.

Infrastructure

Access to markets may undermine the ability to attain collective action, since community members may have more exit options to markets. On the other hand, greater access to markets may increase the demand for some kinds of organisational development related to economic opportunities, unless entry of private firms or state intervention displaces the need for such development (Bebbington et al. 1996; Uphoff 1986). Market access may also influence participation in CPR management by affecting village members' access to information and knowledge of alternative organisational forms, as well as by affecting economic opportunities. However, Ostrom (1992) suggest that isolated communities are more likely to be successful in CPR management. Thus the expected impacts of measures of market access are ambiguous.

In 1982, the government of Botswana introduced a rural roads development programme (LG 117). The main objective of the programme was improvement, construction and maintenance of district roads using labour-based methods. People in rural areas are employed for about 180 days in a year and can earn up P1500 per annum. The cost per job was used to estimate the programme expenditure per household (INFR).

8. Demographic Variables

Demographic variables used in this exercise are age, gender and household size. The age of household head (AGE) matters because it signifies the household's experience in managing common resources as well as accumulation of social capital. Older people have historically experienced relatively stable rules and norms pertaining to collective action over much longer periods than household heads that are younger. Therefore higher levels of CPRI are expected to be associated with higher age level of the household head.

Gender (SEX) The variable gender is used to test the effect of the gender differences on the level of participation in CPR management. It has been argued that women are more co-operative than men are, and there is some experimental evidence pointing in this

direction (see: Folbre 1994, Eckel and Grossman 1996). It has been reported elsewhere that an index of women's effective participation has strong explanatory power in predicting the level of success of a given common property regime (Molinas 1998). Moreover, a higher percentage of females in the household might explain the individual participation of women as group members if daughters replace mothers in domestic work. The gender variable allows us to see the difference in the capacity to participate and use common pool resources between men and women. This helps to account for inter-household differences in participation in management of a CPR by different households due to gender differences. This is of particular importance given that rural Botswana is characterised by a large number of female-headed households. Generally women participate more in resource harvesting from a CPR than men. Management of a CPR may require a balanced participation of both men and women. The variable gender is used to test the effect of the gender on the household on the level of participation in CPR management. Moreover, a higher percentage of females in the household might explain the individual participation of women as members if daughters replace mothers in domestic work. I expect a positive relationship between female gender and the likelihood of the household participating in CPR management.

3. Empirical Findings

Principal components analysis was used to construct the CPRI, and the results of factor analysis are presented in Table 3.1. There are generally two rules that are used to determine whether variables are dominating in a factor. As a rule of thumb, variables with coefficient of an absolute value above 0.5 are said to be dominating in a factor (Lise, 2000). The other rule is the use of eigenvalue or what is commonly known as Kaiser criterion, where all factors with eigenvalues greater than one are used in the analysis. The rationale for choosing this particular value is that a factor must have at least variance as large as that of a single standardised original variable. As depicted by Table 3.1, the measures of CPRI are highly correlated with one another, with all coefficients significant at 0.05% level. This shows that factor analysis points to one common factor which all of the elements of CPRI load. The single factor has a communality of 3.922 and accounts for 69.5% of the combined variance of the individual elements. All indicators of participation

are dominating with a factor loading of ≥ 0.5 or ≤ -0.5. The CPRI is constructed by taking a simple sum of scores over participatory indicators.

Table 3.1: Common Property Resource Management Index (CPRI) Factor Pattern

	Co-operation Indicators	Factor 1
QW	Quantity of Work	0.855
QP	Quality of Protection	0.964
SCA	Support for Collective Action	0.972
VA	Voluntary Action	0.855
SPC	Support for Policy Change	0.725
	Variance Explained	69.5

Number of observations: 500

Extraction Method: Principal Component Analysis

The dominant variables in the first factor, are all related to attitudes towards management of the CPR (SCA), and quality of protection (QP). The quality of protection is and attitudes towards management of CPR are associated with economic considerations since a highly conserved resource ensures sustainable economic benefits. The indicator for quality of protection has a high factor loading of 0.964. The indicator for with respect to support for collective action also has a high factor loading of 0.97. Other indicators of co-operation such as voluntary action and support for policy change also load positively high on the first factor. The overall results show that participation in CPR management consists of all dimensions in the index. That is, participation encompasses attitudes towards management of CPR, quality of protection, support for social action, voluntary action and support for policy change.

The highest household score of 4.75 was registered in the village of Mabele in the Chobe Enclave. The lowest score of 0.44 was registered in East Hanahai and West Hanahai in the Ghanzi/Kgalagadi area. Given the social differences in Ghanzi/Kgalagadi, in terms of ethnicity, the pattern of participation varies in terms of attitudes towards management of CPR.

Generally households in the Chobe Enclave had higher scores in CPRI, with one score of 0.49 for the village of Satau; the rest of the villages had a score of more than 1. Households in the Ghanzi/Kgalagadi scored between a range of 0.46 to 4.04. The low scores on CPRI in the area may there is limited agreement on how to manage the CPR, and this may possibly be due to social heterogeneity.

In general the results of the factor analysis on indicators of participation results in two important considerations for participation, which are social and economic. The high factor loading on support for collective action is indicative of social participation, this is the most important consideration in case of CPR management. The high factor loading with respect to quality of protection is indicative of social cohesion. The CPRI constructed through factor analysis is used in the next section as a dependent variable against a range of variables, representing theories that explain collective action in management of CPR

3.2 The Econometric Evidence and Regression Results

Table 3.2 shows our regression results for the complete sample. The dependent variable is an index of participation (level of social capital). The regressors include a set of individual characteristics, which, in our model, may influence the individual's capacity to participate. An R^2 of 0.864 explains a high proportion of the dependent variable. This means that 86% of the variance is explained by the relationship between participation in CPR management and the predictors. The results in the table below shows under which conditions a household is likely to choose the level of participation in management of a CPR. Several hypotheses were put forward in the literature about the determinants of co-operation in CPR management, which are discussed below (Ostrom, 1990; Lise, 2000; Bardhan, 2000). Variables for some of the hypotheses have statistically significant coefficients.

Table 3.2 Regression Results for Overall Sample

	Coefficients	Std. Error	Significance Level. (P-value)
Constant	.390**	.073	.000
ETHN	-.0093	.011	.404
AGE	.0013	.001	.245
SEX	.1300***	.037	.000
EDU	.0154	.017	.387
HHS	.0202**	.007	.002
OPRSH	.0774	.029	.007
PTVSH	-.0257	.018	.155
PUBSH	.1930	.212	.361
CPRSH	.1320**	.067	.050
FRMSZ	.0329***	.005	.000
LIV	-.0213*	.012	.062
INFR	.0421***	.001	.000
DOMT	.6960***	.045	.000
GST	.1620***	.047	.001

Model Summary

Number of Observations: 500

R Square	Adjusted R Square	Std. Error of the Estimate
.864	.860	.3745491

*, P<0.1, **, P<0.05, ***, P<0.01

Most of the literature associates social heterogeneity with weak social cohesion. However, highly unequal communities might exhibit a widespread adherence to hierarchical norms that facilitate monitoring and enforcement of rules governing the commons. The results on social heterogeneity partly conform to this theory. It was hypothesised that ethnic difference limits participation in CPR management. The coefficient for the ethnicity variable is negative but not significant. This means that although ethnic differences affect participation in CPR management negatively, it does not do so significantly. Therefore, we fail to reject the null hypothesis that ethnic differences do not matter. Another variable for the social heterogeneity hypothesis is membership of the dominant tribe in the village. The coefficient for this variable is positive and significant. This means that the higher the proportion membership of the dominant tribe, the higher the level of participation in CPR management. This is because it will be easier to mobilise collective action given there is a dominant group to take leadership. This means that homogeneity among leadership enhances capacity for collective action. A heterogeneous group is likely to find solutions to collective

action dilemmas as long as there is reasonable a degree of homogeneity among the leadership group. Therefore, heterogeneity does not generally hinder collective action. This is demonstrated by the case of the Chobe Enclave Conservation Trust (CECT), whose membership comprises members from different tribes and villages. Despite this, the CECT is rated a success story and role mode of CPR management in Botswana. This means that heterogeneity issue must be contextualised, made conditional and studied as a dynamic process related to changes in social relationships. These results prove that shared values or interpretation of social problems can facilitate co-operation in the use of commons irrespective of social diversity. The hypothesis that membership of a dominant tribe or group does promote participation in CPR is supported by the results.

The age variable has a positive and but not significant coefficient. This means that older people are likely to participate in CPR management than younger ones. This can be explained by the fact that younger people tend to migrate to urban areas to seek employment. Older people who have no job opportunities in the cities or who have retired tend to remain in rural areas. However, age does not significantly affect decision to co-operate in CPR management. There is positive significant link between participation and gender, which indicates that more involvement of women enhances participation in CPR management. Generally women, irrespective of tribal affiliation, are more involved in the CPR in terms of harvesting commodities for household use. Therefore, the null hypothesis that gender differences does not matter is rejected and it is concluded that females enhance participation CPR management more than their male counterparts.

Educational attainment positively influences participation in CPR management but not in a significant way. This means that when education is significant, it has the potential of stimulating an individual's capacity to participate in CPR management and the capacity to agree on collective action irrespective of social heterogeneity. In terms of policy intervention in resource conservation, an increase in educational attainment will increase participation in management of a CPR. However, the results show that education is not a dominating factor given that the coefficient for education is not statistically significant. The null hypothesis that education makes no difference in one's capacity to participate in CPR conservation is not rejected.

Household size is positively and significantly linked to participation in CPR management. This means that smaller households are less likely to participate than bigger ones. Participation in collective action has an opportunity cost, hence for households with fewer members there is likely to be a trade-off between participation in CPR management and pursuing income generating activities. Hence the hypothesis that household size does not contribute to participation in CPR is rejected, and the conclusion is that the size of the household is positively associated with participation in CPR management.

The share of own produce, private transfers, public transfers in household income, farm and livestock ownership were used as proxy indicators for wealth. The alternative hypotheses about these were that their coefficients are negative. On the contrary, the results show that the coefficients of share of own produce to household income (OPRSH) and farm size (FRMSZ) are positive and significant, implying that these factors enhance capacity to participate in CPR management. The explanation of this may be that as a source of wealth or income, they fail to offer exit options. This phenomenon may be explained by the fact that most of the households in the study area may not produce enough to meet their household livelihood needs, hence they are keen on participating in the conservation of a CPR because it offers supplementary commodities to meet household needs. The hypothesis that own produce and farm size offer exit options and influence participation in CPR negatively is rejected. The coefficient share of public transfers to household income is positive but not significant, implying that public transfers positively influence participation in CPR management but not significantly. The coefficient of the share of private transfers in total household income is negative but not significant. This means that when significant, the share of private transfer in household income inversely affects the decision to participate in CPR management.

Livestock ownership has a significant negative coefficient. This means that the number of livestock is negatively associated with participation in CPR. If the number of livestock owned is increased, the level of participation in the CPR management will decrease. This can be explained by the fact that in the case of Botswana, livestock

ownership is considered to be the major source of wealth. This is further promoted by several government policies that favour those households with numbers of cattle. Such households with cattle have access to private land. For instance, under the auspices the Tribal Grazing Land Policy, people who own 400 or more cattle have access to ranches. The results also confirms the issue of dual grazing rights, whereby people who have access to ranches tend to also use communal land for grazing. They are likely not to participate in CPR management because they do not have a high stake in the CPR as they have alternative private grazing land. This means that if resource users have lucrative opportunities outside a CPR, this affects their individual incentives to co-operate in sustainable management of the CPR. In the case of Botswana, the richer or larger common users are prone to defect (Badharn et al, 2000). The rules for exclusion of non-members in this case are not applicable because usually it is the owners of larger numbers of cattle who are also community members. All the community members interviewed do not have regulations regarding excluding community members from grazing in communal forests if they have ranches. Therefore, a possible policy intervention in this case is remove dual rights. The conclusion is that wealth is significantly inversely related to participation in CPR management.

A high level of dependence of a household on a CPR resource was hypothesised to be positively associated with high level of participation in CPR management. The variable for dependence on CPR in terms of the share of CPR income on total household income has a positive and significant coefficient. The implication of this is that high CPR dependence stimulates people's co-operation to conserve a CPR. This suggests a higher level of CPR dependence means that the people have a higher stake in the CPR, which is reflected in their higher level of participation.

Infrastructure is associated with the development of associations, including market, and political and social associations, which help knit people together in networks of mutual support. Generally it is believed that market development affects CPR management negatively. Proponents of this theory, including Ostrom (1990) and MacKeany (1995) suggest that for effective CPR management regime, the community or user group should be isolated from the market. Direct access to market is viewed as a deterrent in co-operation and management of a CPR. However, this is not supported

by the results. The coefficient the infrastructure variable is positive and highly significant. This implies that access to markets through provision of infrastructure induces participation in CPR conservation.

Government support through policy provision initiated modern day CPR management in Botswana, especially with respect to wildlife. Even though traditionally Batswana managed natural resources under a common property regime, government policies have been prohibitive with respect to certain resources. Changes in government policies in favour of community involvement in biodiversity conservation provided motivation and competence among resource users in establishing effective CPR management. This is supported by a positive and significant coefficient for the variable on government support. This means that if government support or policy becomes more conducive, then an increased participation in collective action should be expected. This confirms the theory that conducive policy environment facilitates effective management of CPRs.

3.1 Regional Disparities in Participation in CPR Management

To offer more insights into participation in CPR management, a comparative analysis of dimensions of participation was done on the basis of constructing a regional CPRI, which contained more variables than the overall CPRI for the whole sample. From Table 3.3, in the case of Chobe, measures of CPRI are highly correlated with one another, with all coefficients significant at 0.05% level.

Table 3.3: Household Collective Action Index

Activities		Chobe	Ghanzi/Kgalagadi
Kgotla Meetings	KG	0.634	0.453
Village Development Committee	VDC	0.911	0.724
Regiment Activities	RG	0.731	0.816
Conservation Trust Activities	CTM	0.750	0.607
Fire Prevention	FRP	-0.547	0.719
Resource Monitoring	RM	0.586	0.571
Observation of Harvesting Regulations	OHR	0.897	0.619
Other Community Activities	OTHER	0.621	-0.484
Percentage of Variance Explained		69.21	62.76%
Number of Observations		236	264

Source: survey

The factor has a communality of, and accounts for 69 % of the variation. The dominant variables in the first factor are all related to extent of participation in collective action towards CPR management. Fire prevention and resource monitoring are indicative of quality of protection. However, the fire prevention is almost negatively dominated by the factor loading of –0.547. This is surprising result because fire prevention is usually a public good. One community members' action to prevent fire is bound to benefit all. However, the Chobe results can be explained by the fact that besides fires started by poachers, there are also natural fires in the area. Therefore fire prevention entails a lot of putting out frequent fires. Therefore, although people consider fire prevention as important, they are not fully participating in the activity for various reasons. The majority of respondents indicated that they lack motivation about this activity because it entails a high level of risk, either through being mauled by wild

animals or being killed by the fire itself. The overall results show that participation in common property resource management in the Chobe Enclave consists of all dimensions in the index.

In the case of Ghanzi/Kagalagadi, the measures of CPRI are highly correlated with one another, with all coefficients significant at 0.05 and 0.01 level. The single factor has a communality of 5.02 and it accounts for 62% of the variation, and differs considerably with the factor pattern for Chobe Enclave. Given the social differences in Ghanzi/Kgalagadi, in terms of ethnicity, the pattern of participation varies in terms of attitudes towards *Kgotla* meetings. This variable is not dominating in the first factor, implying that there is dissatisfaction about the way the *Kgotla* meetings are conducted. Issues relating to other community activities are generally not agreed upon (factor loading -0.484). This is almost dominating negatively, which may symbolise the general disagreement on how these activities are run. Fire prevention measures in CPR management dominate the factor in the case of Ghanzi/Kgalagadi.

Table 3.4 gives the econometric analysis results for the two regions. The results show a striking difference between Chobe and Ghanzi/Kgalagadi in terms of household participation in CPR management. In the latter, the coefficient of ethnicity affiliation variable is positive and significant, indicating that ethnic differences enhance participation in CPR management. This supports the theory that households that are from tribes of low social status may experience problems in terms of establishing collective action for CPR management.

Table 3.4 Regression Results For the Two Regions

Chobe				Ghanzi/Kgalagadi			
Variable	Coefficient	Std Error	P value	Variable	Coefficient	Std Error	P value
Constant	-.415***	.048	.000	Constant	-.7190***	.065	000
ETHN	.143***	.004	.000	ETHN	-.139	.006	.404
AGE	.0613***	.000	.000	AGE	.0006	.001	.245
SEX	-.0464***	.013	.000	SEX	.0623***	.020	.000
EDU	-.0054	.006	.387	EDU	.0073	.008	.387
HHS	-.0073**	.002	.002	HHS	.0097**	.004	.002
OPRSH	-.0277**	.010	.007	OPRSH	.0372*	.016	.007
PVTSH	-.847***	.016	.000	PVTSH	-.0123	.010	.155
PUBSH	-.0692	.076	.361	PUBSH	.0929	.115	.361
CPRSH	.0009	.006	.155	CPRSH	.0635**	.037	.050
FMSZ	-.0578***	.017	.001	FMSZ	.0752***	.003	.000
LIV	-.0005	.000	.245	LIV	.0118***	.001	.000
INFR	.0078*	.004	.062	INFR	-.0105*	.006	.062
DOMT	.0092	.006	.155	DOMT	.939***	.025	.000
GST	.0393***	.002	.000	GST	.0776***	.025	.001
R-Squared		0.983		R-squared	0.969		
Number of Observations		236		264			

*, P<0.1, **, P<0.05, ***, P<0.01

In the case of Ghanzi/Kgalagadi, the ethnicity coefficient negatively affects the level the social status of a household is enhanced either through marriage or wealth accumulation, the level of participation will be reduced. Does this mean that social heterogeneity is important to participation in CPR management? Does this mean that in situations where there are no castes or people of low social status, co-operation in CPR management will be undermined? There is distinctive social stratification of the people in the study area. Although Bushmen are the majority in the settlements covered by the study, they do not always influence decisions given their low social standing. Therefore, in some societies social heterogeneity matters, especially in cases where the indigenous people are sharing a common resource with other groups with a high level of social standing. Social heterogeneity seems not to matter only in cases where tribes are more or less of the same social status, as it is the case in the Chobe Enclave.

There are striking differences again in demographic variables. For Chobe the coefficient of age is positive and significant whereas in Ghanzi/Kgalagadi the coefficient is positive and not significant. In Chobe, increase in age significantly influences participation in CPR management. With respect to Ghanzi/Kgalagadi, it seems older people are more likely to participate in the CPR management than younger ones but this does not influence the capacity to participate significantly. Generally younger people tend to migrate to urban areas to seek employment. Older people who have no job opportunities in the cities or who have retired tend to remain in rural areas.

The linkage between participation in CPR management and gender shows different patterns for both regions. There is a negative significant link between participation and gender in Chobe, which indicates that more involvement of men enhances participation in CPR management. In Ghanzi/Kgalagadi, there is positive significant link between participation in CPR management and gender. This implies that in this region increased participation of women significantly increase participation. Regional differences may be explained by differences in culture and traditional practices. However, generally women within each region irrespective of tribal affiliation are more involved in the CPR in terms of harvesting commodities for household use. Therefore, it is in their interest that the common resource is conserved.

The coefficient for education in both Chobe and Ghanzi/Kgalagadi has a statistically significant linkage with participation. However, education is negatively associated with participation in the Chobe Enclave. This implies that less educated people participate more in CPR management than those with high levels of education. The issue of exit options can explain this. Educated people have relatively high opportunities of earnings opportunities outside the commons. This can reduce their stakes in CPRs. In the case of Ghanzi/Kgalagadi, education is positively associated with level of participation. This confirms the theory that education does stimulate participation. It expands people's level of understanding of government policies, and their entitlements to resources. A typical example is that of the Basarwa, who through settling in permanent areas and assimilating into the whole society are now able to acquire education. This in turn expands their participation in collective institution

building. In both regions, the coefficient of education variable is not significant, which means that education negatively but not significantly influence sparticipation in CPR in the case of Chobe but positively and not significantly influences participation in Ghanzi/Kgalagadi.

Household size is significantly and negatively related to participation in Chobe. This is somehow contradicts the earlier observation because generally increase in household size should provide additional members who can be spread over several household activities, including participation in CPR conservation activities. The case of Chobe may be explained by the issue of level of dependence and diversified income sources, such that large households put increasing pressure on CPR. Based on this analogy, increase in household size will have negative effects on the CPR. In the case of Ghanzi/Kgalagadi, there is significant positive relationship between participation in CPR management and household size. This means that participation in CPR management is strongly influenced by the size of the household. In the case of Ghanzi/Kgalagadi, this may be explained by fact that majority of the people covered by the sample are mainly hunters and gatherers. In order for a household to participate in CPR management without jeopardising its income generating activities, it has to be large. Smaller households are less likely to participate.
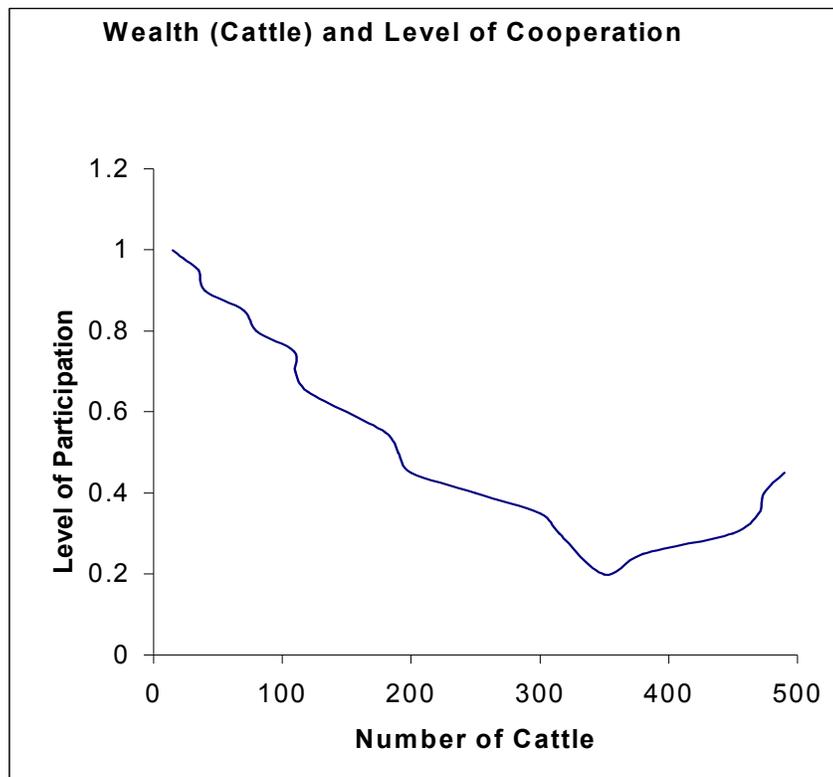
All coefficients of the four variables that relate to wealth are negative for the Chobe case, indicating that these have a potential of offering exit options. The coefficients for the share of own and share of private transfers of total household income have a significantly inverse relationship with participation in CPR management. Although public transfers negatively affect participation, the coefficient of the share of public transfers in total income is not significant. The coefficient for farm size is negative and statistically significant, implying that farm size indirectly increases with participation. In the case of Ghanzi/Kgalagadi, the coefficients of the share of own produce and farm size are positive and significant. This may be explained by the fact that *Basarwa* of late were just settling in permanent places, and also that their income sources not diversified, hence own production and land acquisition are part of the participation process in terms of asset accumulation and establishing collective action. Public transfers positively but not significantly influence participation in the region. This can be explained the fact that *Basarwa* are the poorest societal group in

Botswana, and most cases they rely on government transfers for a variety of welfare issues. Uptake of government transfers is a form of economic participation hence it influences other social participation.

The results on ownership of cattle also show diversity between the regions. The coefficient for livestock ownership has a negative significant linkage with the level of household participation in CPR management in Chobe. Those who have large herds of cattle are less likely to participate than those who have a few.

High levels of wealth provide opportunities outside the commons (exit options). Those with large herds can afford to buy fodder for their livestock or can have access to private grazing land.   The graph below shows a u-shape relationship between participation in resource conservation and ownership of cattle in Chobe. At lower levels of wealth, there is tendency to participate in CPR management. However, as wealth increases, say between 150 and 300 cattle, individuals reduce their participation in conservation of CPR. This means that the effects of exit options set in. An explanation may be the fact that there are no formal rules that constrain the use of a CPR by those with large number of cattle. Cattle ownership in Botswana is highly skewed, with the majority owning no cattle or few cattle while a few individuals own a large percentage of the national herd. In this context, communities that have a more equal distribution of wealth might exhibit higher levels of rates of resource conservation than more unequal ones.

However, at high levels of wealth, from 350 head of cattle, there is a turning point at which interest in management of CPR again resurfaces. This can be explained by the fact that at high levels of wealth, priorities may change in favour of resource conservation, which could be motivated by desire to be accepted by society in terms of political aspirations.

Wealth (Cattle) and Level of Cooperation

Level of Participation (y-axis: 0, 0.2, 0.4, 0.6, 0.8, 1, 1.2)

Number of Cattle (x-axis: 0, 100, 200, 300, 400, 500)

In the Ghanzi/Kgalagadi, coefficient of livestock ownership has a positive significant link with participation. Possibly this is because the majority of respondents were Basarwa, who own small herds if any. The majority hardly use the CPR for grazing. Therefore increase in ownership of cattle in the area is likely to increase dependence on the CPR.

This is very interesting economic consideration which needs to be taken into account when introducing certain policies. For instance, people who would be affected by the introduction of grazing fees are generally the Bushmen and the poor, who are still in the process of wealth accumulation. Acquiring cattle as a form of wealth accumulation will lead to a high level of dependence on the CPR. On the other hand, a

high level of dependence on the resource will induce reduction conservation up to the point where exit options effects set in.

The coefficient for household level of dependence on a CPR is positive for both areas but not significant for Chobe, again reflecting the regional differences in term of CPR use. In Ghanzi/Kgalagadi where the coefficient of the share of CPR of household income is positive and significant, it is not surprising since it is in the interest of those who depend highly on a common resource to ensure its conservation. In the case of Chobe, diversified sources of income reduce heavy dependence on a CPR management. Diversified income sources provide opportunities to use none-CPR commodities. For example, a household with a high income is more likely to use gas for cooking and heating, and kerosene for lighting. A household with a low cash income is bound to use firewood for these purposes. Therefore, high economic heterogeneity is likely to affect individual decisions to participate since it provides exit options. Due to limited economic opportunities in the Chobe area, a lot of household members migrate to urban areas for job opportunities. A high proportion of the cash income is accounted for by remittances. In the Ghanzi/Kgalagadi, the share of CPR to the total household income has a positive significant link with participation. This implies that increase in CPR income provides incentives to participate in conservation. Again looking at the composition of cash income in the region, especially among Bushmen, the source of income from other public transfers is sale of veld products and handicrafts. Bushmen receive very low wages if any, so they heavily rely on public transfers and cash sales from CPR commodities. Therefore, in Ghanzi/Kgalagadi, cash sales provide economic incentives to participate in the conservation and sustainable utilisation of the CPR. The overall finding on this variable supports Baland and Platteau, who argue that there is need to distinguish between various forms of heterogeneity in the analysis and explanation of collective action (Baland and Platteau 1995; 1996), especially in relation to heterogeneity in endowments, entitlements, and economic interests. However, a close look at the source of the cash income presents a modification to Baland and Platteau. In the Chobe Enclave, the major source of cash income is private transfers through remittances while in the Ghanzi/Kgalagadi the major source of cash income is sale of CPR commodities. Therefore, economic heterogeneity should be contextualised in terms of the composition of the income.

Conclusion

The propensity to participate in CPR management is influenced to a large extent by household's characteristics, but also depends on the composition and degree of heterogeneity of the community. Based on factor analysis and multiple regression analysis, a strategy for successful CPR management can be derived. It seems reasonable to suggest that government should provide a conducive policy environment because it is the ultimate owner of natural resources whereas local communities may only have use rights. The process of policy change in favour of CPR management should commence in those villages where participation is most likely to take place, as concluded from the regression results. For instance, the best chances for participation can be found among the villagers who significantly depend on the CPRs.

Participation in any community activity is a time-intensive activity and therefore it is essential to create conditions where the benefits of participation are greater than the costs of non-participation. Conducting frequent village level meetings or late-night meetings may increase the costs of participation for those staying in far-off fields. Further, holding frequent meetings often leads to participants suffering from diminishing interest and results in low attendance, and hence inadequate representation of the community in decision making. Interest based activities therefore need to be identified to serve as an incentive for participation for regular meetings. For example, initiation of regular savings and credit activity at adult literacy classes, or income generating activities as a part of the regular meetings. In Chobe, basket making is an important activity carried out by the women during meetings while in Ghanzi/Kgalagadi, jewellery making also is an activity that takes place while the participatory meetings are on going.

The most common assumption working to the detriment of CPR management practices is the existence of homogenous societies. The existence of such communities is largely a myth as people come together for specific objectives and then disassociate once that objective is met unless bound by another common objective. The more appropriate term would be the existence of user groups in a community, which are threaded together by a common resource problem and its

solution. The user groups however are heterogeneous in all other attributes viz. In social, economic and political orientation. Consequently, the whole village or an entire community cannot be a homogenous entity as generally assumed. Furthermore, the resource boundaries rather than the village boundaries are a technically more appropriate way to deal with CPR management.

Wealth heterogeneity has serious implications for CPR management. The case of cattle as a form of wealth, and its distribution in Botswana has serious implications in terms of government intervention with respect to fostering participation. Incentives and subsidies provided by government and aid agencies are often skewed in nature to benefit only a privileged few. For example, the TGLP as a private-land based subsidy aimed at decreasing the pressure on common land. It was the rich farmers who benefited the most as they were allocated large areas of land, some of which could be left fallow for land improvement activities. Even in the case of borehole construction to harvest underground water, it was the rich farmers who managed to sink boreholes. Now they stand to benefit most from the fencing policy, which allows them to fence off land surrounding their boreholes. Mechanisms therefore need to be built into the incentive regime to elicit equal participation from all, especially households without livestock who are most likely to be secluded from any benefits except for secondary employment benefits. Stressing on labour contribution rather than monetary contribution from the households is more likely to benefit economically weaker households. Focusing on public land based subsidies vs. private land based subsidies may also provide equitable benefits in certain situations where the resource is scarce and it is more advantageous to convert it to a public good rather than a private good.

Households depend on a CPR for several services. In the case of Chobe and Ghanzi/Kgalagadi, the same resource has a different use value for different sections of the community. Hence conflicts arising in terms of what value to conserve and manage is natural. In such cases, it becomes important to focus on creating win-win situations rather than win-lose situations. For example, in the case of animal quota in Ghanzi/Kgalagadi, it may be strategic to allow the *Basarwa* a part of it as subsistence to enable the them to take immediate benefits from it as they stand to lose the maximum on selling the whole quota to safari hunters.

Understanding the social dynamics of a community is important in designing any user group programmes. This is perhaps the most important condition to successful CPR management projects. A community may be fragmented by a number of attributes such as ethnic heterogeneity, occupations, and political orientation. In such cases, the focus should be on involvement of all sections of the society right from the planning to the execution stage. Political orientation and power equations too need to be assessed in planning of CPR management projects. Understanding of local customs, religions and norms too become important, as it is often possible to use them for building community partnership. Planting of sacred tree species for example in common land would automatically create a religious fencing around the land for its protection.

CPR management can be a successful strategy in place of the top-down management practices provided that the policy, social and economic conditions are favourable. Some CPR management systems have existed for centuries, and may continue to operate with no external intervention of any sort. The way ahead is given by the model used in this dissertation which is based upon household level factors that directly affect the specific needs of the local communities. The focus should be on formation of different user groups, with adequate attention paid to the societal dynamics. Conflicts arising in resources management should be seen as an indicator of vibrant practices and can never be completely done away with.

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