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Do households gain from community-based natural resource management? An evaluation of community conservancies in Namibia

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Acronyms

ADMADE	Administrative Management and Development Programme (Zambia)
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources (Zimbabwe)
CBNRM	Community-based Natural Resource Management
SEHS	Socio-economic Household Survey
WILD	Wildlife Integration for Livelihood Diversification Project

EXECUTIVE SUMMARY

Community-based natural resource management is an important strategy to conserve and use sustainably biodiversity and wildlife in Namibia. In this paper, we seek to examine the extent to which conservancies have been successful in meeting their primary goal of improving the lives of rural households. We evaluate the benefits of community conservancies in Namibia by asking three questions: (a) Do conservancies significantly increase household welfare? (b) How does the change in a household's welfare resulting from the conservancy vary by household socio-economic characteristics? (c) Does participation in the conservancy increase household welfare relative to those who choose not to participate? The analysis is based on a socio-economic household survey conducted in 2002 across seven conservancies and 1,192 households.

The results of the analysis suggest that community conservancies do have a positive impact on household welfare. We also conclude that this impact is poverty-neutral in some regions and pro-poor in others. The analysis supports the claim that the welfare benefits from conservancies may be more evenly distributed between participant and non-participant households than one might expect.

1. INTRODUCTION

Over the last two decades community-based natural resource management (CBNRM) has become an important strategy in the conservation and sustainable use of biodiversity and wildlife in Africa. Projects such as CAMPFIRE in Zimbabwe and ADMADE in Zambia are well-known examples, which have motivated other programmes in Africa (Newman and Webster, 1993). Namibia's community conservancy programme is somewhat different. It was largely shaped by the presence of successful commercial conservancies which form a multi-million dollar wildlife industry (Jones and Murphree, 2001). Nonetheless, over the last 10 years, Namibia's conservancy programme has developed into an important road map for sustainable rural development.

Most community-based wildlife management programmes aim to meet at least two complex goals: conservation of nature and economic empowerment of rural households. The underlying premise is that communities can profit from wildlife management if they are given sufficient authority and control over wildlife resources. Thus such programmes invariably involve some devolution of state authority over wildlife management to either community or district government organisations; increased community involvement in the protection of fauna and flora; new jobs created through increased tourism, protection, or NGO activities; and benefits to rural households either directly or indirectly through community projects. The community conservancy programme in Namibia shares some of these characteristics. It accords communities with rights over wildlife resources if they are able to identify conservancy boundaries; have a well-defined membership; choose a representative committee to implement programmes; and develop an acceptable constitution (Jones, 2001). The local villagers benefit by being able to negotiate contracts with tourism agencies, manage game guards and game hunting activities, and make decisions about different revenue sources and uses.

In this paper, we seek to evaluate the impacts of Namibia's conservancy programme, focusing on one of its primary goals – improving the lives of rural households. Community conservancies in Namibia are still evolving. Therefore, evaluating impacts at this stage should provide some useful insights for planning and further development of the conservancy programme.

We assess the benefits of community conservancies by asking three specific questions: (a) Do conservancies significantly increase household welfare? (b) How does the change in a household's welfare resulting from the conservancy vary by household socio-economic characteristics? (c) Does participation in the conservancy increase household welfare relative to those who choose not to participate? Our analysis is based on a survey of approximately 1,000 households in seven conservancies within the Kunene and Caprivi Regions of Namibia.

We use quantitative programme evaluation techniques to determine the impacts of conservancy creation. First we assess whether households in established conservancies are better off relative to households in new conservancies. We evaluate household income and three other income-expenditure measures of household welfare and ask whether differences in these measures can be attributed to the presence of conservancies. By analysing impacts on four indicators of household welfare, we examine the robustness of the results. Our results suggest that community conservancies have a positive impact on household welfare; we also conclude that this impact is poverty-neutral in Kunene and pro-poor in Caprivi.

The second part of the paper focuses on households who report that they are participants in the conservancies. We restrict our analyses to established conservancies and ask whether there are significant welfare gains to participating households. While a simple perusal of data suggests that

participants are indeed better off, statistical analysis (controlling for differences amongst households) leads to more ambiguous results. The analysis supports the claim that the welfare benefits from conservancies may be more evenly distributed between participant and non-participant households than one might expect.

In interpreting our results, we need to consider whether household income-expenditure measures are reasonable indicators of overall well-being. Conservancy benefits accrue in the form of communal public goods as well as household income. To the extent that these public goods impact income, household welfare measures are adequate. However, to the extent that household income measures do not fully capture all the benefits created by conservancies, our analysis may be under-estimating the returns from community management. The results suggest that households living in established conservancies gain relative to comparator groups, yet participants themselves may not see noteworthy benefits. We interpret this to mean that the community benefits of conservancies dominate individual benefits, and that these community benefits are beginning to have an indirect and positive impact on households.

2. BACKGROUND ON COMMUNITY CONSERVANCIES IN NAMIBIA

CBNRM in Namibia illustrates the nature of the challenge such activities pose and the role of history in shaping community efforts. In 1968, Namibian colonial authorities granted white commercial farmers conditional rights over certain wildlife species, and allowed them to use and exploit wildlife for game and trophy hunting, and tourism (see Jones and Murphree (2001) for a detailed account). These rights were reinforced through the Nature Conservation Ordinance of 1975 (Barnes and De Jager, 1996). Individual farmers pooled their land to provide wildlife with the required habitat, and created large *private* conservancies. There are currently 24 private commercial conservancies, covering an area of around four million hectares. These commercial conservancies include 900 farms and make up 42% of the total conservation areas in Namibia.

In 1995, the post-Independence government laid out a set of progressive access rules for communal lands.[1] Under a new Policy on Wildlife Management, Utilisation and Tourism in Communal Lands, *communal* conservancies, or areas where communities could economically exploit and gain from wildlife resource management, were created (Jones and Murphree, 2001). The first communal conservancy, Torra Conservancy, was created in 1998. Many others have since been established, totalling 29 registrations by 2003 and encompassing an area of more than 74,000 square kilometres of wildlife habitat.

Community conservancies complement the ecosystem and biodiversity benefits provided by Namibia's protected area system. Namibia has a total area of 110,000 square kilometres designated as state land for conservation. Out of the 29 registered conservancies, 17 either border or are located between conservation areas. This means that there is an additional 47,515 square kilometres of land adjacent to protected areas for cooperative conservation management, providing wildlife with more opportunities for mobility and flexibility between seasons. This is of particular significance during times of drought or poor rainfall distribution.

[1] Communal land refers to areas where property is commonly held and with some form of Traditional Authority in place. However, all communal land in Namibia belongs to the State.

So far, few studies have quantitatively assessed the impact of Namibia's community programmes. However, in a review article of community conservation in Namibia, Brian Jones (1999b) provides detailed anecdotal evidence; he concludes that conservancies have had a positive impact on natural resource stocks. For example, wildlife numbers in the Kunene Region improved significantly through the late nineties; poaching appears to have declined in Kunene, as well as in parts of Caprivi. In terms of welfare benefits, Jones determines that communities have benefited in cash and kind. These rewards accrue at the community level as well as the household level. For example, by the end of 1998, Torra Conservancy had gained some US$40,000 from profit-sharing agreements with a tourist lodge. Meat distribution is a further important benefit. Other monetary revenues include cash for services to lodges, bed-night levies, wages for guards and other employment, and income from sale of skins (Jones, 1999b).

Barnes *et al.* (2002) analysed the financial and economic returns to investments in five conservancies, including some of those studied here. Several years of financial records and future conservancy management plans were combined into 10-year cost-benefit models, measuring the merits of conservancy investment from the perspectives of the project, the national economy, and the communities themselves. The results showed that, at least collectively (at the conservancy level), communities investing in conservancy development can expect high returns on their investment. The study did not examine the distributional patterns associated with, or planned for, these returns.

3. DATA

For our analysis, we use data from a household survey conducted in 2002 by the Wildlife Integration for Livelihood Diversification (WILD) Project and the Environmental Economics Unit of the Directorate of Environmental Affairs, Ministry of Environment and Tourism. The survey included 1,192 households in seven conservancies from two regions, Kunene and Caprivi.

The survey does not include any households living outside the seven conservancies, thus we cannot evaluate conservancies by comparing households living outside conservancies with those living within conservancies. To overcome this data limitation we utilise the fact that the full benefits from a conservancy can be achieved only after the conservancy has been in operation for several years: we thus distinguish between two types of conservancies: 'established' and 'comparator'. We then evaluate differences in income measures between these two types of conservancies.

Established conservancies include those that were registered in or before 1998.[2] These comprise Torra and ≠Khoadi //Hôas in Kunene, and Salambala in Caprivi. In contrast, the comparator conservancies were registered in or after 1999. Thus, Sorris Sorris and Ehirovipuka in Kunene, and Mayuni and Kwandu in Caprivi are comparator conservancies. The difference in the starting date for comparator and established conservancies is one year in Caprivi, and three to four years in Kunene: as a result we expect the differential impact of conservancies to be underestimated in Caprivi. We present the Caprivi results for completeness.

Table 1 (overleaf) summarises household income, education, and other characteristics for each conservancy in the sample. The three high household income conservancies are Torra, Salambala,

[2] While conservancies were formally registered only in the mid-nineties, community conservation activities had started in some of the conservancy areas in the 1980s.

and Kwandu. These are also the three conservancies with a higher proportion of households with education up to grade 10 or above. Table 1 also indicates that the dominant occupation in the two regions is subsistence agriculture and livestock rearing. Approximately 40% of the surveyed households were female-headed.

Table 1: Key characteristics of conservancy by region

	KUNENE				CAPRIVI			
	Torra	**≠Khoadi //Hôas**	**Sorris Sorris**	**Ehirovi-puka**	**Salambala**	**Mayuni**	**Kwandu**	**Total**
Year started	1998	1998	2001	2001	1998	1999	1999	
Total number of households	84	210	175	150	206	183	184	1,192
Number of participants	63	80	52	87	53	30	38	403
% participating	75	38	30	58	26	16	21	34
Average income (N$)	11,234	8,054	8,307	6,090	8,953	6,540	8,410	8,046
% households with education:								
Grade 9 and below	52	71	70	77	34	54	51	58
Grade 10 and above	48	29	30	23	66	46	49	42
% households with electricity	6	7	5	1	9	0	1	4
% female-headed households	43	42	41	39	40	42	36	40
Main occupation of head (% households):								
Formal employment	35	8	13	8	9	5	5	10
Informal employment	14	15	10	4	12	11	3	10
Subsistence agriculture (includes livestock)	39	65	66	72	50	63	84	64
Cash crop farming	0	0	0	0	14	14	3	5

Table 2 shows the relationship between households and conservancies. This includes information on participation, income from conservancies, conservancy awareness and benefits.

Table 2: Household and conservancy characteristics

	KUNENE				CAPRIVI			
	Torra	**≠Khoadi //Hôas**	**Sorris Sorris**	**Ehirovi -puka**	**Salambala**	**Mayuni**	**Kwandu**	**Total**
Average income from conservancy (N$) (1)	11,921	5,771	3,214	3,000	4,970	5,373	1,978	5,689
No. households with conservancy income	26	12	24	6	37	28	14	147
Average wage income from conservancy	2,615	1,850		967	2,541	3,866	3,136	2,578
No. households with conservancy wage income	15	8	0	18	26	20	17	104
% households with conservancy payment (2)	27	15	0	9	14	10	8	11
% households with damage by wildlife (3)	35	50	30	31	69	74	86	56
% household with conservancy interaction:								
Contributed to conservancy (q49)	11	20	4	30	7	4	2	11
Know about the conservancy plan (q50)	29	18	11	25	25	18	29	21
Consulted with plans (q50a)	39	18	14	27	26	19	28	23
Know the conservancy constitution (q51)	49	30	17	32	26	16	24	26
Household's benefit from conservancy (% household):								
Provides jobs to the household members	6	0	0	15	13	8	11	8
Distribute meat to the households	76	62	7	26	2	0	0	21
No advantages	13	37	79	48	44	58	55	49

Notes:

1. The average household income from conservancies is derived from total income reported by household members and their corresponding occupational status related to the conservancy (Type B). Type B occupation includes both direct employment by the conservancies as well as wage and enterprise income indirectly arising from the conservancy. If a person reported his/her occupation to be of type B with no secondary occupation, then the total income reported by that person is assumed to be from the conservancy. If the person reported primary occupation of type B and another secondary occupation not related to the conservancy, then 75% of his/her income is assumed to be from the conservancy. If a person reported type B to be his/her secondary occupation, then 25% of his/her income is assumed to be from the conservancy. Individual conservancy incomes are added to obtain household conservancy income.
2. Households reporting conservancy payments as top three contribution to livelihood or cash income are included.
3. Households reporting damage to both crops and livestock are included.

The WILD survey recorded the number of people in each household who were conservancy members. Some households reported all infants and children as well as adults to be members of the conservancy, while others reported only adults to be members. To avoid problems from such data inconsistency, we define participant households as those with at least one conservancy member. The highest level of participation is in the longest established conservancy – Torra Conservancy, where 75% of households are participants. Overall, 34% of the households considered themselves

as participants in the conservancies. On average, 26% of the households reported that they knew about the conservancy constitution.

The average household income from conservancies is derived from total income reported by household members and their corresponding occupational status related to the conservancy (Type B). Type B occupation includes direct employment as well as wage and enterprise income indirectly arising from the conservancy. Individual conservancy incomes are added to obtain household conservancy income.[3] Except for Torra, average incomes from conservancies are lower than average household income. This shows that households who obtain income from conservancies also have other sources of income. On average, only 12% of the households sampled reported any income from conservancies.

Table 2 also shows that there are non-income-related benefits accruing from conservancies. In Kunene, the majority of the households in established conservancies considered distribution of meat a key conservancy benefit. For example, 76% of households in Torra and 62% of households in ≠Khoadi //Hôas indicated meat distribution as a conservancy-related gain. We were unable to include such non-income assistance in our analysis.

Table 3 (overleaf) compares households in established and comparator conservancies. The average income of households in established conservancies is higher than that of comparator conservancy households. Thus it may appear that the differences in household income are a result of the conservancy influence. However, the average level of male and female education in the established conservancies is also higher. It is also appears that established conservancies may have access to slightly better infrastructure: a higher percentage of households in established conservancies have electricity relative to the comparator group.

Table 3 shows the differences in the sources of livelihoods in the two regions. In Kunene, most households reported agriculture as their primary source of livelihood. In Caprivi, households were divided between livestock, formal and informal employment.

[3] Conservancies provide wage employment and self-employment opportunities, income through hotel levies, meat to households, and community-level income through tourism-related contracts and agreements (Jones, 1999a and 1999b). Unfortunately, the household survey data does not collect information on community-related benefits.

Table 3: Household characteristics by control and treatment conservancies

	KUNENE CONSERVANCIES		CAPRIVI CONSERVANCIES	
	Comparator	**Established**	**Comparator**	**Established**
Number of households	325	294	367	206
Income	7,284	8,963	7,477	8,953
Selected monthly expenditure	715	762	570	1,492
Females 16-55	1.6	1.5	1.4	1.6
Males 16-55	1.5	1.4	1.3	1.4
Dependency ratio	1.2	1.0	1.1	1.3
% household education:				
Grade 9 and below	72.9	66.0	52.0	34.0
Grade 10 and above	27.1	34.0	48.0	66.0
% female education:				
Grade 9 and below	72.6	71.8	74.1	51.0
Grade 10 and above	27.4	28.2	25.9	49.0
% households with electricity	3.1	6.5	0.3	8.7
% female-headed households	40.3	42.2	39.2	40.3
Most important source of livelihood reported by % households:				
Arable production (own use)	2.5	0.0	70.0	46.1
Arable production (cash cropping)	0.3	0.0	1.9	3.4
Livestock production (own use)	41.2	16.3	1.9	6.3
Livestock production (sales)	10.8	24.2	0.3	1.9
Formal employment	10.8	17.4	3.5	6.3
Informal employment	7.1	13.6	2.5	6.3
Pensions	18.8	21.4	7.6	9.7

Note: The comparator conservancies in Kunene are: Sorris Sorris and Ehirovipuka. The established conservancies are: Torra and ≠Khoadi //Hôas. The comparator conservancies in Caprivi are: Mayuni and Kwandu. Salambala is the established conservancy in Caprivi.

4. METHODOLOGY

The 2002 WILD Socio-economic Household Survey (SEHS) was designed primarily to evaluate the impact of conservancies on household incomes and assess how such impacts vary among households with different socio-economic characteristics. Based on our initial assessment of the data, we focus on three specific questions:

1) Do conservancies significantly increase household welfare?
2) How does the change in a household's welfare resulting from a conservancy vary by household socio-economic characteristics?
3) Does participation in the conservancy increase household welfare relative to those who choose not to participate?

A key concern with the 2002 SEHS is that it collected household information only after the implementation of CBNRM programmes. Thus we do not have the baseline data that is particularly useful for conducting programme evaluation. Because of this and other information limitations

related to data inconsistencies, we try to evaluate the impact of conservancies by using different methods to cross-check the robustness of results.

We measure household welfare using four different indicators: household income and expenditure, and per capita income and expenditure. It is often argued that income measures are subject to larger measurement errors and are more volatile, particularly in countries where agricultural and informal sectors constitute the major part of the economy (Deaton, 1997). In contrast, household expenditure yields a more accurate measure of living standards. In the following programme evaluation, we employ both measures.

4.1 Evaluation of conservancy impact

Method (1): Simple comparison without controls
This method essentially involves comparing the mean income/expenditure between two groups of households: those living within conservancies (in this case, established conservancies within the region) and those residing outside conservancies (here, the newly established ones). The differences in the mean income (or expenditure) between the two groups of households are expected to capture the impact of the conservancies. A significant t-test suggests that the existence of conservancies increases household welfare.

It should be noted that the 'simple comparison without controls' method is only valid when the conservancy is randomly assigned among different localities, i.e. localities with and without conservancy programmes should have similar observable and unobservable characteristics. In reality, such random experiment design is often not possible simply because public programmes are often intended to improve the welfare of targeted groups. Also it is often impossible to assign programmes randomly across localities because of institutional or political constraints. Another problem is that households may selectively migrate to areas where conservancies are more successful, in which case this method will lead to a biased estimate of the conservancy effect. Given the data available and limited evidence of selective migration, we assume that selective migration is less of a concern.

Method (2): Multivariate analysis of welfare impacts of conservancies
To control for differences in observable characteristics, we use a model of household income determination to evaluate the effect of conservancies. Household welfare is treated as a function of household characteristics, and whether that household is residing in an established conservancy.

The household income/expenditure equation can be written as:

$$\ln y = \alpha + \beta X + \gamma C + \varepsilon \qquad \textbf{(1)}$$

where y is household income or expenditure. X is a vector of covariates, including a dummy for households with highest education between seventh and ninth grade; a dummy for households with highest education above tenth grade; a vector of dummies for the occupational classification of the head of the household; the number of people in the household between the ages of 15 and 65; total crop area of the household, the number of months the households harvested fuel wood in the past year, a dummy if the household reported crop or livestock damage by wildlife; female-headed household dummy; and livestock and asset indices, which are constructed using the principal component method. C is a dummy variable taking the value 1 for households that reside within an established conservancy and 0 otherwise.

The estimated coefficient of *C* reflects the conservancy impact on household welfare. The coefficient can be interpreted as the proportion of household income increase (in the semi-log specification) for households living in an established conservancy compared with those not living in established conservancies, after controlling for other factors.

It should be noted that estimates of the conservancy impact using cross-sectional data can be seriously affected by omitted variable bias and selection bias.[4] There could exist geographical and infrastructural characteristics that make certain areas more suitable for conservancies as well as affect welfare indicators of households. For example, better roads may result in better access for tourists as well as better access to markets. Thus, the existence of better roads in one area may make it more suitable for conservancy development, and better access to market stemming from the same road may imply higher income for the households in that area. This is unlikely in our study areas, but since we do not have the infrastructure data, we cannot control for these village/conservancy-level characteristics.

It can be argued that even within a programme such as the conservancy programme, the economic benefit households derive may differ (Jalan and Ravallion, 2002). For example, better-educated households may reap more economic profits relative to less-educated households. We test for differential conservancy benefits by using a set of interaction dummy variables in equation **(2)**

$$\ln y = \alpha + \beta X + \beta_1 C * yZ + \beta_2 C * nZ + \beta_3 nC * yZ + \varepsilon \qquad \textbf{(2)}$$

where *X* includes all the covariates specified in equation **(1)**; *C* is the established conservancy dummy; *nC* is the dummy for comparator conservancies; yZ is a social characteristics dummy such as high education, female-headed households, asset-rich, and livestock-rich. *nZ* represents either low education, male-headed households, asset-poor, or livestock-poor. Thus the coefficient β_1 where *yZ* is high education, for example, tells us the additional income gain accruing to better-educated households within established conservancies, compared to less-educated households within comparator conservancies. Households with education attainment of grade 10 and above are defined as high-education households. Households in the third quintile or above with respect to asset index are defined as asset-rich. Livestock-rich households are similarly defined in terms of livestock index. The reference group is the *nC*nZ* (for example, comparator conservancy, low education).

The differential welfare benefit from established conservancies to households with high education is given by (β_1 - β_2 - β_3): that is, if (β_1 - β_2 - β_3) = 0, households with high education do not enjoy any extra benefit from established conservancies. If (β_1 - β_2 - β_3) > 0, then high-education households gain more from conservancies than low-education households. Conversely, if (β_1 - β_2 - β_3) < 0, the greater conservancy benefits may be accruing instead to low-education households. The

[4] To correct the omitted variable bias, we need panel data from before and after establishment of conservancies. Unbiased conservancy impact results can be obtained from estimating conservancy impact changes in household incomes, assuming unobserved area characteristics remain constant over time, i.e. the 'difference in difference' method (Heckman and Smith, 1999). While the collection of panel data can substantially enhance the power of programme evaluation, the costs of data collection can also be considerably higher. Another way of dealing with omitted variable bias is the instrumental variable method (Heckman, 1997). However, we do not have any conservancy-level area characteristics data and no suitable instrument variable that may influence establishment of a conservancy in one location, but not influence household welfare. As a result we are unable to use this method to the measure the conservancy effect on household welfare.

interpretation of (β_1 - β_2 - β_3) for female-headed households, asset-rich households, and livestock-rich households are similar.

4.2 Evaluation of economic impact of participation in conservancies

The 2002 survey (Table 2) shows that among the seven conservancies, the proportion of household participation in conservancy programmes ranges from 16% in Mayuni to 75% in ≠Khoadi //Hôas. To evaluate the impact of participation, we first analyse the determination of participation.

4.2.1 Determinants of participation

We use the following probit model to analyse the determination of participation.

$$\text{Prob}(\text{Participation} = 1) = \varphi(\beta X + \gamma VP) \qquad \textbf{(3)}$$

where X includes all the household-level covariates as specified in equation **(1)**. The VP is the proportion of households reporting to be members of the conservancy at the village level. VP captures the peer pressure effect of other participating villagers on a household. The function $\varphi(.)$ is a commonly used notation for the standard normal distribution. We use the maximum likelihood estimation method to estimate **(3)**.

4.2.2 Evaluation of the impact of participation

Method (1): Simple comparison without controls

The basic idea of this method is outlined in the section on evaluation of conservancy impact. To evaluate the participation effect, we use a sub-sample (households who live within conservancies) and compare the mean income/expenditure between participating and non-participating households.

Method (2): Multivariate analysis

To control for observable household characteristics, we use an income determination model, similar to that of equation **(1)**, to evaluate the impact of household participation in conservancies.

The household income equation can be written as:

$$\ln y = \alpha + \beta X + \beta P + \varepsilon \qquad \textbf{(4)}$$

where X has the same set of covariates as in **(1)**. P is a dummy variable, taking value 1 for participants, and 0 for non-participants. We assume that the participation decision is exogenous, rather than a choice variable.[5] This is a strong assumption, and we relax this assumption in the next step and test its validity in the analysis.

Similar to the conservancy dummy C in equation **(1)**, the estimated coefficient of P reflects the impact of participation in the conservancy on household welfare. The coefficient can be interpreted as the proportion of household income increase (in the semi-log specification) for participants compared with non-participants after controlling for other factors.

[5] One such situation may be when all households within a village are automatically made members of the conservancy and households are not allowed to opt out of participation. Another case where this assumption is true is when participant households are selected randomly by an outside organisation.

As with the conservancy analysis, the multivariate estimates of the programme impact of participation using cross-sectional data can also be biased due to omitted variables. There could exist a correlation between the participation decision and unobserved household characteristics, which affects outcome variables. For example, households who are better informed about potential benefits from conservancies are more likely to participate in these programmes. Very often such better-informed households also tend to be able to generate higher income. However, household characteristics such as the ability to get access to information are unavailable from the survey, hence the estimation can suffer from self-selection bias.

One way of dealing with selection bias (i.e. correlation between the participation decision and unobserved household characteristics) is the instrumental variable method (Heckman, 1997).

Method (3): Instrument variable method
This method depends crucially on the availability of a valid instrumental variable. We argue that the proportion of village-level participation is a potentially valid instrument. This variable is correlated with household participation, but does not affect household income directly. The instrumental variable method involves an estimation of a two-equation system: the household's income equation and the participation decision equation.

The two estimated equations are equations **(3)** and **(4)**, where *VP* is the instrument variable as it measures the peer pressure effect of other participating villagers on a household. This peer pressure influences the participation decision, but has no impact on the household welfare measures. We test the hypothesis that participation is endogenously determined by each household along with their income and consumption decisions.[6]

The estimated coefficient of the participation dummy from the two-equation system is expected to provide an unbiased estimate of the impact of participation in conservancies on household incomes.

Method (4): Propensity score matching method
The propensity score matching method is regarded as one of the best alternatives when random experiment design is not possible (Rubin, 1973). This method is particularly appealing in circumstances where only cross-sectional data is available.

A propensity score is an index that is based on the probability of a household participating in the established conservancies. Thus, in this paper, the propensity scores are based on estimations of equation **(3)**. The propensity score is used to match the non-participants (i.e. the comparator group) with the participants (i.e. the treatment group) on the basis of a set of observed characteristics summarised in the propensity score.[7] A significant difference between the mean incomes

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[6] The distribution of the error terms **(3)** and **(4)** have zero means and standard deviation and correlation coefficients of $\begin{bmatrix} \sigma & \rho \\ \rho & 1 \end{bmatrix}$. The two equations are simultaneously estimated by the maximum likelihood method. We test the hypothesis that the coefficient of participation in the income equation is significantly different from zero. We test the hypothesis that $\rho = 0$.

[7] We used Gaussian kernel matching for households within common support in this analysis. In kernel matching each participating household is matched with the weighted average of all non-participating households. The weights are based on the difference in propensity score between the participating and non-participating households. The standard errors are bootstrapped.

(expenditures) of the two matched groups indicates the existence of participation effects on household welfare.

It should be noted that none of the above listed methods is perfect. Our intent in using several methods to evaluate the impact of the conservancy programme or participation is mainly driven by data availability and the potential for checking consistency and robustness of results.

5. RESULTS

5.1 The conservancy impact

Table 4 summarises the impact of established conservancy programmes on household welfare (measured by household income, per capita income, household expenditure and per capita expenditure) relative to comparator conservancies. We report results from the simple comparison without controls and multivariate methods. The second part of Table 4 shows the differential impact of socio-economic characteristics on household welfare in established conservancies. As reported earlier, while our focus here is on household income and expenditure measures as indicators of conservancy benefits, these may not fully account for other community-level benefits which also occur as a result of conservancies.

Table 4: Key results, impact of conservancy by region

	Kunene		**Caprivi**	
1. Simple comparison without control, mean differences in:				
a) Mean household income	1299.83	*	1702.36	**
(Changes in proportion)	(0.20)		(0.24)	
b) Mean per capita income	589.50	**	45.53	
(Changes in proportion)	(0.44)		0.03	
c) Mean household expenditure	-15.77		757.41	**
(Changes in proportion)	(-0.02)		(1.32)	
d) Mean per capita expenditure	17.01		143.13	**
(Changes in proportion)	(0.12)		(1.05)	
2. Multivariate analysis (changes in proportion):				
Overall effects of conservancy programme				
a) Household income	0.18		-0.12	
b) Per capita income	0.28	**	-0.18	
c) Household expenditure	-0.05		0.63	**
d) Per capita expenditure	0.04		0.58	**
Interaction effects between conservancy programme and:				
A. High education on:				
a) Household income	-0.41	**	-0.21	
b) Per capita income	-0.51	**	-0.24	
c) Household expenditure	0.19		-0.35	*
d) Per capita expenditure	0.07		-0.37	*

Continued overleaf

B. Female-headed households:				
a) Household income	-0.30		0.21	
b) Per capita income	-0.23		0.14	
c) Household expenditure	-0.04		0.32	*
d) Per capita expenditure	0.00		0.23	
C. Asset-rich households:				
a) Household income	0.03		0.19	
b) Per capita income	-0.07		0.14	
c) Household expenditure	0.13		-0.44	*
d) Per capita expenditure	0.03		-0.48	*
D. Livestock-rich households:				
a) Household income	-0.03		-0.15	
b) Per capita income	-0.22		-0.20	
c) Household expenditure	0.44	**	-0.37	*
d) Per capita expenditure	0.24		-0.41	

Notes:

1. Extreme values of income and expenditure were excluded. Households with annual income above N$50,000 and monthly expenditure above N$10,000 were excluded as extreme values. Households reporting zero income or expenditure were also excluded.
2. Statistical significance of the coefficients are indicated by * for 5% and ** for 1%.

In Kunene, the simple comparison method indicates that households in established conservancies enjoy significantly higher household and per capita income. However, the expenditure measures do not suggest any robust differences in welfare.

In Caprivi, except for per capita income, all the measures of welfare show significant differences in standards of living between households in established and comparator conservancies. For example, mean household incomes are 24% higher for households in established conservancies in Caprivi. However, because the difference between the established and comparator conservancies in Caprivi is only one year, we are less confident about these results.

In general, multivariate analysis confirms the results obtained by comparing simple means. The impact (where statistically significant) of established conservancies as compared with the comparator group is much smaller compared with the simple comparison method. For example, households in established conservancies in Kunene enjoy 29% higher per capita income when the multivariate analysis is used, as opposed to 44% with the simple comparison. Similarly, in Caprivi, established conservancies enjoy 58% greater per capita expenditure when multivariate analysis is used, as opposed to 105% with the simple comparison. The simple comparison results are expected to be biased upward as not all the differences in simple comparisons can be attributed to conservancy-related gains.

5.2 Differential impacts of various groups

Here we focus on the differential impact of various socio-economic household characteristics on the income of households living in established conservancies. The second part of Table 4 shows results of the tests of hypotheses ($\beta_1 - \beta_2 - \beta_3$) = 0 for education, gender, assets, and livestock. These hypotheses test whether there are differences in welfare benefits from established conservancies to households with better education, female heads, more assets and more livestock.

For education the differential effect, where statistically significant, is negative. This implies low education households stand to gain more in welfare from established conservancies. In other words, high education is not always translated into bigger welfare gains from conservancies. This may be because most employment opportunities created by conservancies are for low-skilled workers.

The gender-bias hypothesis – that male-headed households enjoy higher benefits from conservancies compared to their female-headed counterparts is rejected in most cases in Part B of Table 4. Only for household income in Kunene is (β_1 - β_2 - β_3) negative and weakly significant. In contrast, female-headed households in Caprivi enjoy higher net expenditure benefits from conservancies.

Similarly Part C of Table 4, which focuses on asset poverty, shows that (β_1 - β_2 - β_3) = 0 cannot be rejected for any of the welfare measures in Kunene, and for two income measures in Caprivi: that is, asset-rich households do not enjoy higher net benefits from conservancies when compared with their asset-poor counterparts. For expenditure-based measures in Caprivi, (β_1 - β_2 - β_3) is negative: asset-poor households are likely to gain more from conservancy benefits than their asset-rich counterparts. This suggests that benefits from conservancies are pro-poor in Caprivi and poverty-neutral in Kunene, when poverty is measured in terms of assets. However, the situation for livestock-poor households is ambiguous for the two regions.

5.3 Determinants of participation

In this section, we focus on the impact of participation within the established conservancies. Participation by households is defined as those reporting that they are members of the conservancy. Membership may have direct and indirect welfare implications for households who choose to participate.

Table 5 (overleaf) shows the results of determinants of participation in the conservancies in the two regions. Most factors are not statistically significant in either region. The peer effect on participation measured by the village participation ratio is statistically significant in both regions. This shows that if a household resides in a village with a larger proportion of participants, then that household is more likely to be a participant as well.

Table 5: Determinants of probability of participation in conservancy

	Kunene		Caprivi	
Constant	-2.38	**	-2.89	**
	(0.36)		(0.45)	
Grade 7 to 9	0.56	**	0.52	
	(0.19)		(0.45)	
Grade 10 and above	0.73	**	0.68	
	(0.21)		(0.37)	
Formal employment	0.01		0.31	
	(0.33)		(0.45)	
Informal employment	-0.28		-0.06	
	(0.33)		(0.45)	
Cash crop farming			0.02	
			(0.37)	
Retired	0.09		0.07	
	(0.33)		(0.42)	
Self employment			-0.33	
			(0.51)	
Young adults:16-35	-0.07		0.02	
	(0.05)		(0.05)	
Village participation ratio	3.40	**	3.49	**
	(0.33)		(0.46)	
Livestock: principal components	0.07		-0.06	
	(0.04)		(0.27)	
Assets: principal components	0.07		0.29	**
	(0.21)		(0.07)	
Access to electricity	-0.20		0.00	
	(0.19)		(0.29)	
Months fuel wood harvested	0.02		0.04	
	(0.03)		(0.03)	
Crop/livestock damaged by wild	0.42	*	-0.14	
	(0.19)		(0.23)	
Female-headed households	0.09		0.04	
	(0.16)		(0.21)	
N	236		189	
Log likelihood	-123.94		-77.59	
Pseudo R squared	0.24		0.29	

Notes:

1. In Kunene some variables did not have sufficient variation between control and treatment and were dropped.
2. Numbers in the parentheses are standard errors.
3. Statistical significance of the coefficients are indicated by * for 5% and ** for 1%.

In Kunene, two other factors show a significant statistical relationship with participation. First, households with education to at least seventh grade or higher have a higher probability of

participation. Second, a household with crops or livestock damaged by wild animals is also more likely to participate in the conservancy. The latter suggests that households with predation or crop damage problems may view the conservancies as a mechanism for lobbying for changes or compensation.

In Caprivi, the probability of participation appears to be dependent on household ownership of assets, other than livestock: households with more assets are more likely to participate.

5.4 Participation and welfare

Table 6 summarises the impact of participation on household welfare in the established conservancy programmes.

Table 6: Key results, impact of participation by region in established conservancies

	Kunene		Caprivi	
1. Simple comparison without control:				
a) Mean household income	1,667	*	5,110	**
(Changes in proportion)	(0.24)		(0.69)	
b) Mean per capita income	177		849	**
(Changes in proportion)	(0.10)		(0.60)	
c) Mean household expenditure	286	**	218	
(Changes in proportion)	(0.49)		(0.17)	
d) Mean per capita expenditure	54	**	7	
(Changes in proportion)	(0.41)		(0.03)	
2. Multivariate analysis (changes in proportion):				
a) Household income	0.08		0.20	
b) Per capita income	0.10		0.25	
c) Household expenditure	0.11		-0.21	
d) Per capita expenditure	0.15		-0.13	
3. Instrumental variable method (changes in proportion):				
a) Household income	-0.69		0.50	
b) Per capita income	-0.34		0.50	
c) Household expenditure	0.29		-1.21	**
d) Per capita expenditure	0.45		-1.31	**
4. Propensity score matching:				
a) Household income	2,961		1,238	
b) Per capita income	656		16	
c) Household expenditure	206		28	
d) Per capita expenditure	55		9	

Notes:

1. Extreme values of income and expenditure were excluded. Households with annual income above N$50,000 and monthly expenditure above N$10,000 were excluded as extreme values. Households reporting zero income or expenditure were also excluded.
2. Statistical significance of the coefficients are indicated by * for 5% and ** for 1%.

The simple comparison method indicates that participant households in established conservancies of Kunene enjoy a significantly higher standard of living by all welfare measures, except for per capita

income. In Caprivi, only income measures are significantly different among participant and non-participant households.

However, multivariate analysis, instrumental variable and propensity score methods suggest that the difference in welfare between participant and non-participant households is not statistically significant for most of our indicators of welfare.

To summarise our main results on welfare impacts, we find that conservancies have an impact on household welfare, but self-reported participants do not seem to benefit. The first set of analysis focuses on the conservancy impacts. There are positive welfare gains to households in established conservancies relative to new conservancies in both regions. Furthermore, households with lower education levels gain more from conservancy establishment. Benefits from conservancies are poverty-neutral in Kunene and pro-poor in Caprivi.

The second set of analysis focuses on the effects of household participation within the context of established conservancies. Our multivariate, instrumental variable and propensity score analyses do not indicate that participation has a noteworthy effect on household welfare within established conservancies.

6. CONCLUSIONS

This paper fills an important gap in improving our understanding of households residing in conservancy areas in Namibia. By obtaining information on households in seven different conservancies, it allows us to gain useful insights into awareness of and perceptions about conservation, household participation in conservancy activities and the direct and indirect benefits accrued as a result. However, because households which reside outside conservancies were excluded from the 2002 survey, analysis of the impact of conservancies is somewhat difficult.

Survey data reveals that the majority of households have limited knowledge about conservancies and their activities. Only about 23% of surveyed households knew about conservancy plans and some 26% of households had some knowledge about conservancies and their constitutions. Thus, there appears to be is a need for awareness creation and education about the role of conservancies and their potential benefits.

Approximately 34% of households reported that they were conservancy participants. Our analysis of the determinants of participation indicates that participation is mainly influenced by peer pressure. Over time, with increased awareness and development of the conservancies, participation may become more widespread. This could potentially lead to increased ownership and control over conservancy activities among members.

Households gain from conservancies either through cash income, non-cash rewards and community-level benefits. Our survey data shows that only a small number of households obtain a cash income: 12% of the surveyed households reported conservancy-related income. While there is likely to be some under-reporting of income, it is also clear that conservancies have not been a source of cash revenues for most households. It should be noted that conservancies also provide non-cash income. For example, some 21% of all survey households viewed meat distribution as a benefit of conservancies. We are unable to capture the monetary value of such food subsidies.

The largest percentage of households reporting conservancy-related cash income was from Torra Conservancy: 27%. Torra was the first conservancy to be established and conservancy income is the major source of income for reporting households. Thus, as conservancies grow into maturity, it is possible that more households will benefit directly.

Living within conservancies and close to wildlife also comes with costs. Over 50% of the households surveyed reported that they suffered crop or livestock damage from wildlife: therefore conservation of wildlife can also result in significant expenses to households. This makes it all the more important for households to gain direct income from conservancies. Without this, households may increasingly choose alternate land uses over wildlife management.

The main part of our analyses focused on three key questions: (1) Do conservancies significantly increase household welfare? (2) How do changes in a household's welfare resulting from conservancies vary by household socio-economic characteristics? (3) Does participation in conservancies increase household welfare relative to those who choose not to participate?

Despite data limitations, we are able to conclude that conservancies have an overall beneficial effect on household welfare. This result is supported by a simple comparison of indicators of welfare as well as multivariate analyses. We find that the majority of household welfare indicators are higher for established conservancies relative to comparator groups.

The results suggest that the improved welfare effects of conservancies are poverty-neutral in Kunene and pro-poor in Caprivi. There is little evidence to suggest that the better-educated or the asset-rich are gaining more from conservancies relative to their less-educated or poor counterparts. Thus we conclude that conservancies, if not pro-poor, are at least not being dominated by the elite. This is an important finding because a potentially negative effect of decentralised natural resource management is increased power to traditional hierarchies. Community conservancies in Namibia are doing well on this score.

Our multivariate analyses suggest that participants in conservancies do not necessarily enjoy higher levels of income or expenditure compared to non-participants. This does not mean that individual household-level benefits from conservancy development are small; rather the analysis suggests that the welfare benefits from conservancy development may be more evenly distributed between participant and non-participant households than expected.

There is both anecdotal evidence, and evidence from the cost-benefit analyses, of significant community-level benefits from conservancy creation (Barnes *et al.*, 2002). While cash benefits are limited, participants and non-participants also enjoy other non-cash benefits such as meat distribution, community infrastructure etc. These community-wide benefits may be the reason why we find that conservancies have a positive impact on the average household's welfare, but conservancy participants themselves do not gain significantly.

CBNRM faces many challenges in Namibia. The presence of veterinary barriers such as the Foot and Mouth Disease 'Red Line' is one such challenge. The somewhat limited high-level government support for wildlife management, as shown by discrepancies in budget allocation between agriculture and natural resource conservation and management (Weaver and Skyer, 2003), is another source of concern. Community conservancies are still in their growth phase. The results of this study provide some evidence that they have a positive impact on rural welfare; thus it is likely that they will survive and gain support despite these challenges.

7. REFERENCES

Barnes, J. I. and de Jager, J.L.V. 1996. Economic and financial incentives for wildlife use on private land in Namibia and the implications for policy. *South African Journal of Wildlife Research 26 (2): 37-46.*

Barnes, J.I., MacGregor, J. and Weaver, L.C. 2002. Economic efficiency and incentives for change within Namibia's community wildlife use initiatives. *World Development 30(4): 667-681*.

Child, B., Page, K., Taylor, G., Winterbottom, B., //Awarab, K., with Bartel, P. and Grimm, C. 2001. Mid-term review of LIFE-II and assessment of the Namibia national CBNRM programme – Final report. USAID: Namibia.

Deaton, A. 1997. The analysis of household surveys: A micro-econometrics approach to development policy. The World Bank. John Hopkins University Press.

Heckman, J. 1997. Instrumental variables. A study of implicit behaviour assumptions used in making programme evaluation. *Journal of Human Resources 32 (3): 441-61.*

Heckman, J., Lalonde, R. and Smith, J. 1999. The economics and econometrics of active labour market programmes. In Ashenfelter, O. and Card, D. eds. *Handbook of Labour Economics, Vol. III.* Elsevier Science Publishing Co.: New York, USA.

Humphrey, A. and Humphrey, E. 2003. A profile of four communal area conservancies in Namibia. DFID: London, UK.

Jalan, J. and Ravallion, M. 2002. Does piped water reduce diarrhoea for children in rural India? *Journal of Econometrics, Vol. 112, January 2003: 153-173.*

Jones, B. and Murphree, M. 2001. The evolution of policy and community conservation in Namibia and Zimbabwe. In Hulme, D. and Murphree, M. eds. *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation.* James Currey Ltd.: Oxford, UK.

Jones, B. 2001. The evolution of community-based approach to wildlife management at Kunene, Namibia. In Hulme, D. and Murphree, M. eds. *African Wildlife and Livelihoods: The Promise and Performance of Community Conservation.* James Currey Ltd.: Oxford, UK.

Jones, B. 1999a. Policy lessons from the evolution of a community-based approach to wildlife management, Kunene Region, Namibia. *Journal of International Development 11: 295-304.*

Jones, B. 1999b. Rights, revenues and resources: The problems and potentials of conservancies as community wildlife management institutions in Namibia. *Evaluating Eden Series Discussion Paper No. 2.* IIED: London, UK.

Newman, K. and Webster, J. 1993. African biodiversity: Foundation for the future. A framework for integrating biodiversity conservation and sustainable development. Biodiversity Support Programme. World Wildlife Fund: Gland, Switzerland.

Rubin, D.B. 1973. The use of matched sampling and regression adjustments to remove bias in observational studies. *Biometrics 29: 159-183.*

Weaver, C., Larrye, C. and Skyer, P. 2003. Conservancies: Integrating wildlife land-use options into the livelihood, development, and conservation strategies of Namibian communities. Paper presented at the fifth World Parks' Congress to the Animal Health and Development (AHEAD) Forum, September 8-17, 2003, Durban, Republic of South Africa.

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58. **Abbott, J. with C. Hay, M. Kalonga, T. Naesje and J. Purvis. 2003.** The 2002 joint frame survey of fisheries of the Upper Zambezi River (Namibia/Zambia). *DEA Research Discussion Paper 58.* 39pp.

59. **Mulonga, S., Suich, H. and Murphy, C. 2003.** The conflict continues: Human wildlife conflict and livelihoods in Caprivi. *DEA Research Discussion Paper 59.* 29pp.

60. **Halstead, L. 2003.** Making community-based tourism work: An assessment of factors contributing to successful community-owned tourism development in Caprivi. *DEA Research Discussion Paper 60.*

61. **Murphy, C. and Halstead, L. 2003."**The person with the idea for the campsite is a hero." Institutional arrangements and livelihood change of community-owned tourism enterprises in Namibia. *DEA Research Discussion Paper 61.*

62. **Mulonga, S. 2003.** Wild food: Use of natural resources for food in eastern Caprivi. *DEA Research Discussion Paper 62.* 41pp.

63. **Mulonga, S. and Murphy, C. 2003.** Spending the money: The experience of conservancy benefit distribution in Namibia up to mid-2003. *DEA Research Discussion Paper 63.* 27pp.

64. **Murphy, C. 2003.** Community tourism in Kunene: A review of five case studies for the WILD Project. *DEA Research Discussion Paper 64.* 27pp.

65. **Li, B.M.L. and Vaughan, C. 2003.** Social relations and water management: The impact of community-based water management in the ≠Khoadi //Hôas Conservancy of north-west Namibia. *DEA Research Discussion Paper 65.* 23pp.

66. **Krugmann, H., Cole, D. and du Plessis, P. 2003.** Access and benefit-sharing mechanisms for the use of botanical resources in Namibia. *DEA Research Discussion Paper 66.* 52pp.

67. **Schiffer, E. 2004.** How does community-based natural resource management in Namibia change the distribution of power and influence? Preliminary findings. *DEA Research Discussion Paper 67.* 43pp.

68. **Bandyopadhyay, S., Shyamsundar, P., Wang, L. and Humavindu, M.N. 2004.** Do households gain from community-based natural resource management? An evaluation of community conservancies in Namibia. *DEA Research Discussion Paper 68.* 21pp.