



Analysis

Using a choice experiment framework to value conservation-contingent development programs: An application to Botswana

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ABSTRACT

Community Based Natural Resource Management (CBNRM) programs in Botswana have had limited conservation effect because the provision of development benefits is not contingent on wildlife conservation. Building on existing discussions about which development initiatives these programs should implement, we use choice experiment data to empirically determine what value CBNRM community members place on both private and quasi-public development interventions. We show that these interventions are sufficient to incentivize households to engage in anti-poaching enforcement, revegetation of wildlife habitat and wildlife monitoring. Our methodology may be adapted to investigate a range of potential development interventions for which in-kind labor contributions are required.

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1. Introduction

Efforts to integrate wildlife conservation and rural development in Botswana continue to face a myriad of problems. In common with other integrated conservation and development (ICD) programs, Botswana's wildlife-based ICD programs (referred to as Community Based Natural Resource Management or CBNRM programs) seek to encourage sustainable management of wildlife by providing rural communities with tourism-funded development benefits. Unfortunately, these programs have largely failed to improve conservation incentives at either the community or individual level, reduce human-wildlife conflict or generate continued development benefits (Pienaar et al., 2013). Although rural villages capture a share of wildlife-based tourism revenues, the development benefits generated do not appear to offset the substantial costs associated with wildlife conservation, including reduced access to land, crop damage, and livestock depredation (Pienaar and Kerapeletswe, 2005).

Part of this problem may be the specific mechanisms that govern the ultimate use of tourism revenues by communities. In Botswana, tourism revenues flow to Community Based Organizations or 'Trusts'. Trusts

usually lack sufficiently complete, rigorous information on how to allocate funds in a way that would have the greatest chance of achieving conservation objectives, thereby securing future tourism revenues. Since the burden of conservation falls on individual households within a Trust, the two key elements to closing the wildlife conservation loop are 1) providing households sufficient benefits and/or compensation for forgoing actions that destroy wildlife and habitat and 2) ensuring that these benefits are linked to conservation actions undertaken by those same households.

This paper demonstrates a straightforward approach to providing detailed, rigorous and quantitative information to decision-makers about whether a linked conservation-development program is likely to gain the support of those most responsible for the necessary conservation actions, namely village households. Although we focus on Botswana's ICD program, it is worth noting that the approach can be used quite broadly to assess the benefits associated with public investment programs. To implement the approach, we conducted a series of choice experiments about ICD programs that provide rural households with quasi-public and private benefits in return for household participation in wildlife conservation. This information enables us to provide estimates of the value to households of both individual program features and of the program itself.

Since the programs include a work requirement, the approach provides insight into the value of household members' time, in particular the opportunity cost of labor time. This is attractive since in areas

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where labor markets are thin or missing, one would otherwise have to impute a shadow wage from distant labor markets or by other means. The programs also vary in duration, which provides an opportunity to estimate the personal discount rates implied by the observed choices. In addition, the inclusion of cash payments to households in our analysis provides a straightforward way of making program adjustments (by changing the cash payment) to achieve whatever probability of adoption is desired. Since public support of ICD programs no doubt tracks closely with the probability a household would choose them over not having a program, such adjustments can be helpful to build public acceptance of ICD programs in a cost-effective manner.

The data used are from 499 household surveys conducted in five CBNRM programs during 2007. This analysis allows us to determine both how rural households value different development benefits and the mix of development benefits required to incentivize households to engage in wildlife conservation.

The remainder of this paper proceeds as follows. Section 2 outlines the choice experiments and the rationale for the development benefits and conservation tasks included in these experiments. Section 3 develops an estimation model to explain respondents' choices among the offered CBNRM programs. Section 4 presents the data included in the empirical specification. Section 5 discusses the estimated model. Section 6 summarizes the estimated value of conservation program, or CBNRM, attributes. Section 7 provides concluding thoughts about how wildlife-based CBNRM programs in Botswana could be restructured to achieve sustainable development.

2. The Choice Experiments

The purpose of our research is to determine what value rural community members place on various development initiatives, and whether these are sufficient to incentivize them to engage in wildlife conservation. To this end we implemented a series of choice experiments in five CBNRM programs in Botswana: the Molema Trust, the Chobe Enclave Conservation Trust, the Okavango Community Trust, the Nqwa Khobe Xeya Trust, and the Sankuyo Tshwaragano Management Trust.¹ To obtain a representative sample of village households, we used stratified random sampling to survey proportionate numbers of male- and female-headed households, low-, medium-, and high-income households, and households belonging to different tribal groups.

Respondents were given a detailed explanation of the CBNRM programs they were to be offered. They were then presented with four choice experiment questions, which asked them to choose which option they preferred from among two CBNRM programs or no program at all. Each program consisted of a conservation task to be performed by an adult household member, the development benefits provided, and a cash payment to the household. The duration of the programs varied, being one, three, and five years in length. Addelman's (1962) orthogonal main-effects experimental plan was used to determine the combination of CBNRM program attributes in the choice experiments.

Following best practices for implementing choice experiments in a developing country context (Bennet and Birol, 2010), we pretested the survey (in the village of Zutshwa); surveys were conducted face-to-face; and illustrated cards were used as a visual aid for respondents during the choice experiments (See Fig. 1 for an example choice experiment card). Prior to presenting respondents with the choice experiment cards, they were provided with three key pieces of information:

¹ The Trusts differ in terms of geographic location, number of member villages, type of tourism (photographic tourism or safari hunting), length of operation of the Trust, tourism revenues earned and development benefits generated, diversity of wildlife, proximity to tourism centers, tribal composition of the Trust, and employment opportunities within the village and in the nearest regional center. The Sankuyo Tshwaragano Management Trust was the best performing Trust in terms of benefits generated for its members during the research period.

(1) access to development benefits would be contingent on one adult member of the household allocating seven days per month to wildlife conservation for the duration of the program²; (2) no wages would be paid to the household member engaging in the conservation task; and (3) the task could be performed by any able adult member in the household. As such, different adult members could perform the task each month so that the respondent would not necessarily have to allocate his or her time to conservation. This allowed the household greater flexibility in meeting the conservation requirements of the proposed CBNRM program than if a single individual had been required to supply all the necessary labor. But it could reduce the conservation effectiveness of the program by reducing the amount of experience and skill provided by the household. Although we recognize this issue, our purpose was to ascertain which development programs would incentivize rural households to engage in wildlife conservation, rather than to determine the optimal allocation of effort to conservation tasks to maximize wildlife conservation.

The development benefits each CBNRM program offered were 1) zero, six or 12 months of vocational training in basic secretarial, book-keeping and business skills, 2) a cash payment of BWP 0, BWP 600 (US\$ 71) or BWP 1200 (US\$ 143)³ to be paid to the head female of the household at the beginning of the school year, and 3) solar power⁴ to provide light around kraals and the village at night to deter predators, a dummy variable taking the values of zero or one.

The rationale for this selection of development benefits, which are expected to complement existing government-funded development programs such as schools, health clinics and pensions, is taken from the CBNRM literature. When asked to identify which additional development interventions would be of greatest benefit to them, rural households typically prioritize employment, food, cash transfers, and greater authority to manage human-wildlife conflict (Kanapaux and Child, 2011; Musumali et al., 2007). In Botswana, CBNRM stakeholders also identified training, economic diversification, higher savings and improved understanding of natural resources management (Sammy and Opio, 2005).

Rural communities are poor and badly want increased employment (Lepper and Schroenn Goebel, 2010). CBNRM targets tourism employment, but the tourism industry is low density (Vanderpost, 2006) and community members often lack the skills needed to perform more productive, higher paid tourism jobs. Communities would benefit from increased investment in vocational training to increase their marketable skills (Vanderpost, 2006), in particular small business and conservation skills (Wainwright and Wehrmeyer, 1998; see also Gjertsen, 2005).

In addition to improved human capital, communities require increased cash income to meet their consumption needs—potentially through the payment of cash dividends (Lepper and Schroenn Goebel, 2010; Scanlon and Kull, 2009). Rural income in Botswana is low, averaging BWP 2346 (US\$ 211) per month in 2009/10, of which 24% was composed of income in kind, own produce, and government assistance (Government of Botswana, 2011). Remittances or cash transfers are of key importance in meeting consumption needs (Swatuk, 2005), and have been a feature of the CBNRM program in Botswana.

² Respondents were also told that their household would no longer receive development benefits if an adult member of the household failed to complete seven days of conservation activity every month. Respondents were made aware that the CBNRM program would be implemented by an environmental NGO, which implied that their compliance with the program would be monitored by both other village members and a third party.

³ For BWP that are estimated in 2007, the exchange rate of BWP 8.42 to USD 1 is used. To convert BWP to USD in the current year (2013), the exchange rate of BWP 11.13 to USD 1 should be used.

⁴ The choice of solar power to provide electricity needed for lighting around the village and kraals at night was based on the Botswana government's stated commitment to developing solar power. However, electricity could be provided using a gasoline-powered generator, which is less expensive to install and maintain.

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