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研究課題名(和文) Impact Evaluation of Protected Area Management Policy on Household Welfare in Nepal

研究課題名(英文) Impact Evaluation of Protected Area management Policy on Household Welfare in Nepal

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研究成果の概要(和文)：本研究では、バッファゾーン政策(以下、BZ)のインパクト評価を実施するにあたり、3つの国立公園(チトワン、バルディア、ランタン)周辺から1584世帯、サガルマータ国立公園から140の世帯を対象に所得や政策参加有無を調査した。調査の結果から、BZ政策の内外で世帯の状況を比較し、平均処置効果(ATT)を求めた。所得で比較すると、BZ政策の対象地域は、平均19%高くなる結果となった。ただし、職業訓練そのものは、所得を有意に上昇させることは無かったが、職業訓練の中でも、観光開発訓練だけでみれば、52%の所得増加がみられた。

研究成果の学術的意義や社会的意義

BZ政策は、国立公園の収入を一部、周辺世帯やコミュニティに還元することで、所得獲得機会を提供する政策であり、本研究はその成果を世帯調査から明らかにすることである。周辺の、とりわけ貧困世帯にとって、国立公園が隣接することによる獣害は甚大であるから、野生生物との共存策を模索することが求められていた。本研究の成果は、職業訓練、とりわけ観光に特化した職業訓練の場合に、世帯所得の増大につながることを明らかにした。ただし、一般的な職業訓練は必ずしも所得増加に結び付かないことから、国立公園に隣接する点を生かし、観光業に特化した職業訓練の実施が重要である。

研究成果の概要(英文)：Through this research, we have been able to implement questionnaire surveys to evaluate impact of buffer zone policy among 1584 households in three national parks (Chitwan-728, Bardia - 500 and Langtang - 356) and 140 surveys of community representatives in Sagarmatha national park in Nepal.

Based on the analysis of the data for Chitwan National Park, the Average Treatment Effect on Treated (ATT) estimate represents the difference in the means of per capita household incomes between the treated and control groups with the results that on average households in buffer zone have 19% higher income than comparable households outside the buffer zone. In terms of training's effect on buffer zone households, income-generating training does not significantly increase household's income but the tourism development training increases household's income by 52 percent.

研究分野：環境政策

キーワード：バッファゾーン政策 ネパール 国立公園 野生動物との共存 貧困政策

様式 C - 19、F - 19 - 1 (共通)

1 . 研究開始当初の背景

Establishment of protected area affects economic development at local level as it imposes restrictions on use of natural resources by local communities. To counter balance these limitations, PA management policies provide incentives to local communities in developing countries to improve their welfare.

In Nepal about 23.23% of the area is covered by protected areas. To incentivize local communities, buffer zone policy was implemented in Nepal's protected areas since 1996 (Allendorf & Gurung 2016). Buffer zone is surrounding areas next to protected areas where conservation and development programs are implemented to benefit local people. For this, the policy allows sharing of park revenue (up to 50%) with local communities for local development and conservation activities, including income generating and tourism development trainings. The first set of protected areas where this policy was implemented in 1996 include: Chitwan National Park and Bardia National Parks in southern part of Nepal (terai) and Langtang National Park and Sagarmatha National Park in the mountains.

So far, there has not been any systematic efforts to evaluate the effectiveness of various programs implemented under the buffer zone policy even after over 20 years of implementation. Evaluating the household level welfare impacts of the programs is crucial to generate empirical evidence to improve policy decisions and the allocation of park revenue to most effective programs.

2 . 研究の目的

The main purpose of this research project was to evaluate the welfare impacts of buffer zone policy, particularly its training programs to households, by examining the program outcomes from national parks where the policy was implemented first in Nepal. Following are the two research objectives:

(1) Whether and to what extent local development programs such as income generating, and tourism development trainings implemented under the buffer zone policy have contributed to welfare improvement of participating households.

(2) To generate empirical evidence to support policy decisions by comparing the impact of policies across different protected areas where the buffer zone policy was implemented at the same time.

3 . 研究の方法

To estimate the welfare effect of buffer zone policy by examining tourism development and income generating trainings, we primarily applied propensity score matching method. It is

one of the quasi-experimental impact evaluation methods in which treatment group and a control group are carefully matched to measure the effect of the treatment through matching following Tafesse et al. (2020).

- First, we identify the households who have obtained tourism development and income generating trainings prior to 2014 among households in the buffer zone area of the park.
- We also identify sample households who are just outside the buffer zone boundary but have similar socio-economic status as that of households in buffer zone areas.
- We implemented a household survey of 728 households in Chitwan, 500 households in Bardiya, and 356 households in Langtang national parks, except in Sagarmatha national park, over the years as our original plan was severely affected by COVID-19 pandemic. Half of these households were from buffer zone areas and another half from outside the buffer zone areas in each park. In Sagarmatha national park, we surveyed 140 community representatives.
- We then calculated the propensity score, i.e., the probability of a household being participated in the program given a set of observed characteristics for each participating and non-participating household.
- We then matched each participant to one or more non-participants based on their similar propensity scores from the matched set of treatment (participants) and control groups. Once the matching is done, the impact of the program can be estimated by directly comparing the observed outcomes (household incomes) of treatment and control groups in the matched sample.
- The population Average Treatment Effect (ATE) is simply the difference in average outcomes between treated and control groups. $ATE = E [Y_i (1) - Y_i (0)] = E [Y_i (1)] - E[Y_i (0)]$, where, i refers to the households from 1 to n ; $Y_i (1)$ refers to outcomes observed in the presence of the program; $Y_i (0)$ refers outcomes observed in the absence of the program; $E[.]$ refers the expectation operator from probability theory. However, the study intends to quantify the impacts of programs on household welfare by quantifying the average treatment effect on the treated (ATT), which was then computed as:
 $ATT = E [Y_i (1) - Y_i (0) | D_i=1] = E [Y_i (1) | D_i=1] - E[Y_i (0) | D_i=1]$, where “ $| D_i = 1$ ” denotes “conditional on the household being exposed to the treatment group” and “ $| D_i = 0$ ” denotes “conditional on the household being exposed to the untreated, or control, group”. The differences in the outcomes of the treated and of the control group can be attributed to the treatment, i.e. exposed to either income generating training or tourism development training.

4 . 研究成果

The results from the analysis of data from Chitwan National Park, our primary research site for this research as outlined in the research proposal, are presented below.

Key findings:

The Average Treatment Effect on Treated (ATT) estimate represents the difference in the means of per

capita household incomes between the treated and control groups.

- For the buffer zone beneficiaries, the ATT estimates show that households living in the buffer zone have 19 percent higher per capita household income than the households living outside the buffer zone.
- The ATT estimate show that income-generating training does not significantly increase household's income.
- Similarly, the ATT estimate shows that the tourism development training increases household's income by 52 percent.
- In conclusion, the results suggest that the households living within the buffer zone enjoy a greater level of household income than their counterparts who live outside. Therefore, our results demonstrate that the goals of conservation do not necessarily conflict with the goals of poverty alleviation and can be achieved simultaneously.

Appendices of data and results:

Table 1. Categories of treatments with treatment and control groups

Treatment category	Treatment group	Control group
Treatment 1 (Buffer zone beneficiary)	T1: Households residing inside the buffer zone	C1: Households residing in adjacent areas outside the buffer zone
Treatment 2 (Income-generating training)	T2: Households receiving income-generating training inside the buffer zone	C2: Households not receiving the training outside the buffer zone
Treatment 3 (Tourism development training)	T3: Households receiving tourism development training inside the buffer zone	C3: Households not receiving the training outside the buffer zone

Table 2. Descriptive summary of variables and t-test results by treatment category

Variable	Total	Treatment 1 (Buffer zone beneficiary)				Treatment 2 (Income-generating training)				Treatment 3 (Tourism development training)			
		T1	C1	Diff ^a		T2	C2	Diff ^a		T3	C3	Diff ^a	
		(N= 479)	(N= 249)	(N= 110)	(N= 122)	(N= 110)	(N= 122)	(N= 107)	(N= 249)	(N= 107)	(N= 249)	(N= 107)	(N= 249)
Mean (SD)	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	
Per capita income (IHS)	11.31 (1.03)	11.28	11.36	-0.08	11.10	11.15	-0.05	11.64	11.37	11.64	11.37	0.27**	
Per capita employment income (IHS)	5.58 (5.35)	6.19	4.39	1.80***	6.49	5.32	1.17*	6.92	4.40	6.92	4.40	2.52***	
Per capita business income (IHS)	5.06 (5.59)	4.48	6.17	-1.69***	3.07	2.55	0.52	6.71	6.18	6.71	6.18	0.53	
Per capita agriculture income (IHS)	5.05 (4.5)	5.51	4.18	1.31***	6.64	5.31	1.32**	6.78	4.20	6.78	4.20	2.58***	
Per capita remittance (IHS)	2.98 (4.9)	2.89	3.14	-0.24	3.85	4.03	-0.18	2.63	3.14	2.63	3.14	-0.51	
Household size	4.94 (1.87)	5.01	4.79	0.22	5.37	4.67	0.70**	5.28	4.78	5.28	4.78	0.49**	
Average education	6.66 (2.62)	6.52	6.94	-0.42**	5.88	6.41	-0.53	6.76	6.94	6.76	6.94	-0.17	
Age of a household head	48.58 (12.92)	48.62	48.50	0.11	49.33	51.47	-2.13	48.52	48.49	48.52	48.49	0.02	
Dependency ratio	45.20 (54.15)	45.58	44.47	1.10	50.06	48.30	1.75	31.95	44.46	31.95	44.46	-12.51**	
Livestock unit	0.77 (1.74)	0.88	0.56	0.32***	0.77	0.92	-0.14	1.18	0.55	1.18	0.55	0.62***	
Owned land (Ha)	0.27 (0.42)	0.32	0.18	0.15***	0.27	0.23	0.03	0.46	0.17	0.46	0.17	0.28***	
Distance to highway (m)	7940.56 (7051.67)	9404.29	5124.79	4279.49***	9613.63	5325.84	4287.78***	9463.69	5124.79	4287.78***	5124.79	4338.9***	
Remittance received (1 if yes, 0 otherwise)	0.26 (0.44)	0.26	0.28	-0.02	0.35	0.36	-0.01	0.24	0.28	0.24	0.28	0.03	

Note: ^a Statistical differences are evaluated using a t-test and reported at 10%*, 5%** and 1%***significance levels. HIS = Inverse Hyperbolic Sign-transformed

5. 主な発表論文等

〔雑誌論文〕 計6件（うち査読付論文 6件/うち国際共著 3件/うちオープンアクセス 2件）

1. 著者名 岡千尋, フン・ティ・キム・ユン, クウ・ティ・フオン・ドン, 齋藤陽子	4. 巻 24
2. 論文標題 気候変動に起因する労働移動の選択 - メコンデルタにおける農業生産形態の違いに注目して -	5. 発行年 2022年
3. 雑誌名 フロンティア農業経済研究	6. 最初と最後の頁 -
掲載論文のDOI (デジタルオブジェクト識別子) なし	査読の有無 有
オープンアクセス オープンアクセスではない、又はオープンアクセスが困難	国際共著 -

1. 著者名 Kandel Pratikshya, Pandit Ram, White Benedict, Polyakov Maksym	4. 巻 159
2. 論文標題 Do protected areas increase household income? Evidence from a Meta-Analysis	5. 発行年 2022年
3. 雑誌名 World Development	6. 最初と最後の頁 106024 ~ 106024
掲載論文のDOI (デジタルオブジェクト識別子) 10.1016/j.worlddev.2022.106024	査読の有無 有
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1. 著者名 Shin Yunne Jai, Midgley Guy F., Archer Emma R. M., Arneht Almut, Barnes David K. A., Chan Lena, Hashimoto Shizuka, Hoegh Guldberg Ove, Insarov Gregory, Leadley Paul, Levin Lisa A., Ngo Hien T., Pandit Ram, Pires Aliny P. F., Portner Hans Otto, Rogers Alex D., Scholes Robert J., Settele Josef, Smith Pete	4. 巻 28
2. 論文標題 Actions to halt biodiversity loss generally benefit the climate	5. 発行年 2022年
3. 雑誌名 Global Change Biology	6. 最初と最後の頁 2846 ~ 2874
掲載論文のDOI (デジタルオブジェクト識別子) 10.1111/gcb.16109	査読の有無 有
オープンアクセス オープンアクセスとしている（また、その予定である）	国際共著 -

〔学会発表〕 計3件（うち招待講演 0件/うち国際学会 2件）

1. 発表者名 Kandel, Pratikshya, Ben White, Ram Pandit
2. 発表標題 Implications of COVID-19 on Household Income and Consumption in Communities Surrounding Protected Areas in Nepal
3. 学会等名 67th Annual Conference of Australasian Agricultural and Resource Economics Society (国際学会)
4. 発表年 2023年

1. 発表者名 Kandel, Pratikshya, Ram Pandit, Ben White
2. 発表標題 Estimating the Socio economic Impacts of Protected Area Policy on Household Welfare: Evidence from Chitwan National Park, Nepal
3. 学会等名 66th Annual Conference of Australasian Agricultural and Resource Economics Society (国際学会)
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1. 発表者名 秋田谷凜、齋藤陽子、ラム・パンディット
2. 発表標題 ネパールにおける冠水耐性イネ (SUB1) の普及要因 チトワン地区を事例として
3. 学会等名 日本農業経済学会
4. 発表年 2024年

〔図書〕 計0件

〔産業財産権〕

〔その他〕

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6. 研究組織

	氏名 (ローマ字氏名) (研究者番号)	所属研究機関・部局・職 (機関番号)	備考
研究 分担者	齋藤 陽子 (Yoko Saito) (30520796)	北海道大学・農学研究院・准教授 (10101)	
研究 分担者	近藤 巧 (Takumi Kondo) (40178413)	北海道大学・農学研究院・教授 (10101)	

7. 科研費を使用して開催した国際研究集会

〔国際研究集会〕 計0件

8 . 本研究に関連して実施した国際共同研究の実施状況

共同研究相手国	相手方研究機関			
ネパール	Agriculture and Forest University			