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KAHUZI-BIEGA CASE STUDY

Microcredit as a solution to reduce poverty and illegal resource use in protected areas



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Cover photo: Rose Mboumou was able to buy corrugated iron sheets for the roof of her house, pay her children's school fees and start a profitable small business thanks to the microcredit received from WCS. She no longer enters the Park to meet the needs of her family. Credit: D. Detoeuf, WCS.




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ACRONYMS

BNS	Basic Necessities Survey
CARPE	Central Africa Regional Program for the Environment
CCC	Community Conservation Committee
CEF	Comité d'Encadrement Féminin (Women's Management Committee)
DRC	Democratic Republic of the Congo
ICCN	Institut Congolais pour la Conservation de la Nature (Congolesse Institute for Nature Conservation)
NGO	Non-Governmental Organization
KBNP	Kahuzi-Biega National Park
SMART	Spatial Monitoring and Reporting Tool
UECCO	Union des Eleveurs de Cobayes du Congo (Union of Guinea Pig Farmers in Congo)
WBI	Well-Being Index
WCS	Wildlife Conservation Society

SUMMARY

In 2010, WCS launched a microcredit project in the Tshivanga sector¹ of Kahuzi-Biega National Park (KBNP) to reduce the illegal use of natural resources and protect the Grauer's gorilla population and their habitat. In total, 10 villages participated in the project, and 1,236 people benefited from approximately \$150,000 USD of loans between 2010 and 2018. Beneficiaries included men, women, indigenous people and wherever possible, former hunters/poachers, charcoal producers, and bamboo collectors. WCS was the main provider of the seed funding thanks to the CARPE grant, but Fauna and Flora International and the United Nations Environment Program also contributed financially. The microcredit was directly managed by community groups, with supervision from WCS and ICCN.

While many beneficiaries started successful microenterprises, the results of the microcredit project are mixed. Difficulties were encountered with corruption, poor management standards, and low repayment rates – the average loan repayment rate was 63%. The absence of robust control mechanisms and high management costs at the beginning of the project hindered performance. To address these challenges, mechanisms to build capacity and improve management standards and reduce corruption were put in place and continue to be reviewed and improved. From 2015 onwards, management costs were partially covered by the introduction of a new loan interest rate, but if repayment rates cannot be improved, the capital will eventually run out, rendering the project unsustainable. To improve the sustainability of the project, interest rates must reflect the risk of default and inflation, and debt must be restructured in the event of household default, rather than amortized.

¹ The Tshivanga sector is the eastern sector of KBNP – also occasionally referred to as the Highland sector.

Data collected with SMART during law enforcement patrols show that the microcredit project is currently too small to have a meaningful impact on reducing threats to the Park. Two zones of high deforestation were identified during the project, and in these areas, deforestation is shown to have increased. The microcredit project should extend along the buffer zone, but only when a better performance system is in place. It is unlikely that the decline in illegal activities in the beneficiary area was due solely to microcredit. It is highly likely that an increased amount of patrolling has deterred people from entering the Park and engaging in illegal activities.

As patrols are an effective solution to curb illegal activities, the patrolling effort should extend further south in the project area where deforestation is destroying the habitat of the Grauer's gorilla in the Park. It is unlikely that microcredit alone can address the drivers of deforestation in this particular area of the Park, nor the areas further south, as there is insufficient funding to expand microcredit to these areas. The same is true for other deforestation fronts outside the Park.

To increase the impact of the project on reducing threats from hunting, in 2016 WCS connected the microcredit project with a new guinea pig farming initiative, with the aim of providing an alternative source of protein. While both projects saw some success, many beneficiaries failed to make guinea pig farming a viable business. This can be attributed to insufficient support from UECCO and to some misuse of the microcredit funds. Combating the threat posed by unsustainable levels of bushmeat hunting can only be achieved if guinea pig farms are successful and able to produce sufficient animals to meet the demand for protein. This would mean providing better technical support, more efforts to help producers sell their products (and at good prices, especially at mining sites), and continuing to provide microcredit to those that are successful. It is also recommended that guinea pig breeding is combined with other alternative income-generating activities that the beneficiaries have already mastered.

To respond to the threat of firewood collection, local communities need a sustainable alternative to produce energy. Agroforestry for wood production and/or improved fuel-efficient cookstoves could be part of the solution that would address the threats posed by charcoal production and slash-and-burn agriculture. Agroforestry plots have already been planted in 2017 to provide fuelwood to limit villagers' incursions into the Park, and these plantations will mature in 2021. Any technological solutions proposed would require political goodwill from the Bukavu City Council.

Ideally, communities around the Park should be trained in climate-friendly farming practices, in combination with the establishment of agroforestry plots, to increase their yields and reduce the need to clear more forests in the future. These two measures will reduce the demand for new arable land and allow land to be set aside for reforestation. This ecosystem-based approach to climate change adaptation will test the buffer zone and increase income from crop sales. Increasing agricultural yields also opens up the possibility of tackling charcoal production as a driver of deforestation. As households increase their yields, they can earn additional income by making briquettes from post-harvest waste and selling them to intermediaries who sell them to Bukavu as an alternative to charcoal.

In summary, microcredit has the potential to stop illegal activities in Kahuzi-Biega National Park while contributing to poverty reduction, but only as part of an integrated package of solutions that tackle the multiple threats that the Park faces. The decline in illegal activities seen in some project areas was unlikely due solely to microcredit as increased patrol effort will have deterred people from entering the Park and engaging in illegal activities. In addition to being a somewhat isolated solution, unable to tackle the myriad of threats faced, the microcredit project was also too small to have a meaningful impact on threat reduction., Greater impact could be delivered by expanding the area of geographic implementation, ensuring that more robust monitoring and enforcement systems are in place and combining microcredit with other intervention strategies.

Lessons Learned on micro-finance for conservation

- Robust control mechanisms necessary to avoid corruption and improve management;
- Interest must be charged to cover management costs;
- Monitoring and Evaluation system must be in place from the beginning;
- Set up sanction system for non-payment;
- Target beneficiaries in areas of higher threats;
- Micro-credit cannot solve everything: combine with other interventions.

INTRODUCTION

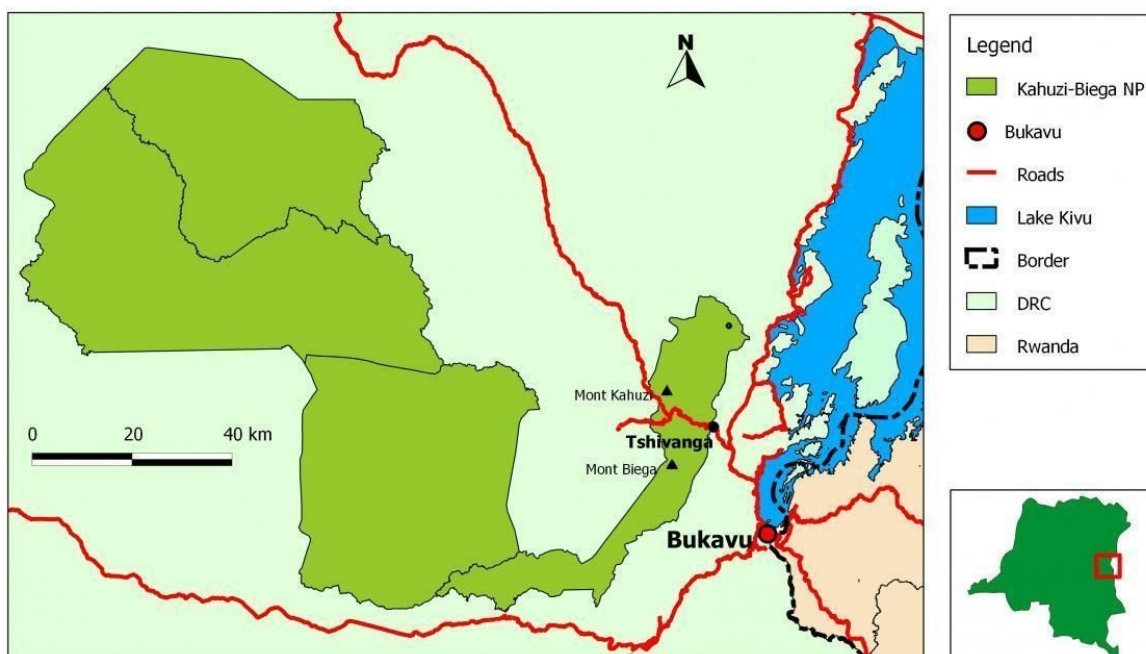


Figure 1: Map of Kahuzi-Biega National Park in eastern DRC.

Biophysical characteristics

Kahuzi-Biega National Park (KBNP) takes its name from its two dormant volcanoes, Mount Kahuzi (3,308 m) and Mount Biega (2,790 m), located in the Mitumba mountain range, which is part of the western ridge of the Albertine Rift. The eastern highland sector is the oldest of the Park (originally being designated as a forestry reserve in 1937) and was listed as a national park in the DRC Official Gazette in 1970. Later, in 1975, the much larger western sectors of the Park were added.

The eastern part, named Tshivanga, is the last remaining part of an Afromontane rainforest that once covered both sides of the Albertine Rift, including the Graben Valley and its lakes. It was once continuous from Mount Hoyo in the north to Kabobo in the south. Tshivanga is a mosaic of Afromontane forest, bamboo and "alpine" meadows. The flora is part of the endemism center of Kivu.

The population of Grauer's gorilla is one of the most important biodiversity features of the Maiko-Tayna-Kahuzi-Biega CARPE landscape. While unique and endemic to the area, the gorilla population has declined considerably in recent years due to poaching and habitat loss, qualifying

for critically-endangered status. Therefore, the primary biodiversity conservation priority in this landscape is to protect the remaining populations of this species.

The KBNP is managed by the *Institut Congolais pour la Conservation de la Nature* (ICCN), a public institution under Congolese law. ICCN is supported in its management by numerous NGOs, including WCS.



Figure 2: The southeastern part of Kahuzi-Biega National Park, which shows a mosaic of Afromontane forests and grasslands and the three main roads that run through the Park.

Demographics

The landscape outside the Tshivanga sector of the Park is densely populated and the city of Bukavu (1,000,000+ people) is only 50 km away from the boundary. There are about 65 villages around the southeast section. The ethnicity of these rural communities are Ba-Shi, Ba-Havu, Ba-Tembo, and Ba-Mbuti, the latter being an indigenous people. Communities on both sides of the Park are connected by three east-west roads crossing the northeast section. The total population in the micro-credit project area is 246,297 inhabitants.

Problem Statement

The Tshivanga sector of KBNP contains an important population of Grauer's gorillas that are threatened by poaching and forest degradation and loss, by men and women of the local communities living in the vicinity of the Park. There is little or no forest left outside the Park boundaries and people are using the Park's natural resources to support their livelihoods. This unsustainable, illegal use of natural resources is driven by poverty, cash shortages and a lack of alternative economic activities. Alternative income-generating activities are further impeded by a lack of access to credit, meaning that the initial investment needed to kick-start a micro-enterprise is not available to people in local communities.

To address these factors and thereby reduce the threats to the biodiversity, WCS introduced a microcredit project. By providing a source of credit to communities living around Tshivanga, local people, including illegal resource users, could have opportunities to create alternative livelihoods, which in turn would reduce the need to use protected natural resources inside KBNP. Additionally, the creation of new microenterprises that credit could enable, would contribute to reducing the persistent and pernicious poverty that exists in these communities.

When the Park boundaries were expanded in 1975, some villages were included inside these new boundaries. To date, this expansion has been a source of conflict between the people and the Park's management authorities. The microcredit project is also a pilot component of a wider toolkit to resolve these park-people conflicts, reconciling conservation with local well-being.

In this case study, we examine whether microcredit has contributed or could contribute as a tool for reducing illegal resource use driven by poverty.

TECHNICAL STRATEGY AND APPROACH

Theory of Change

To understand the causes of forest degradation in the Park, a survey was conducted among the Park's communities. The survey results showed that villagers extracted natural resources from the Park for their own basic needs and also to increase their incomes in order to overcome severe cash shortages. Therefore, a theory of change was developed to respond to the need for cash liquidity in times of shortage.

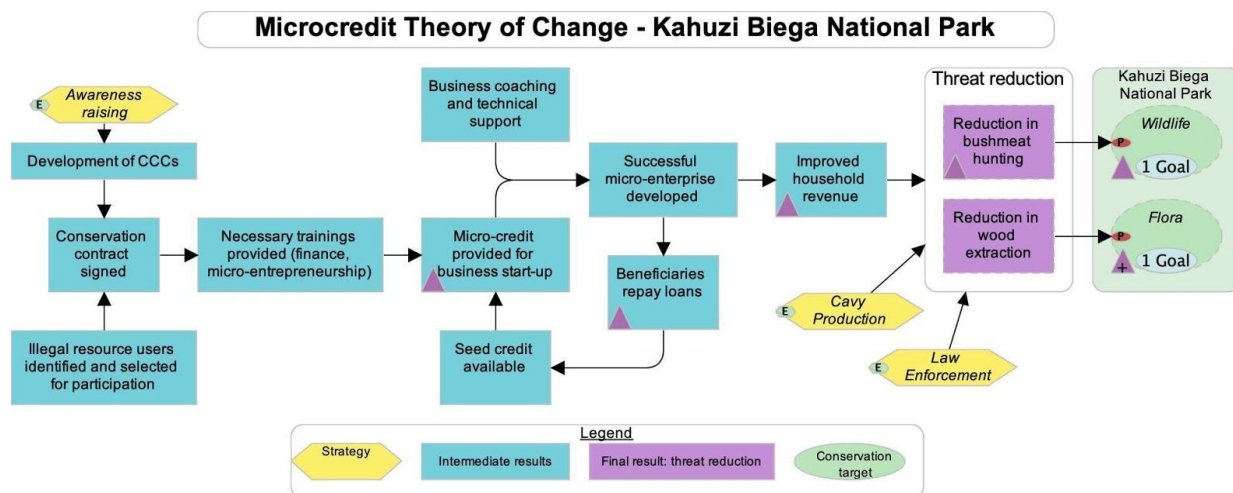


Figure 3: Theory of Change for the microcredit project.

Microcredit has been identified as a tool that has the potential to both contribute to biodiversity conservation and to poverty reduction. The project proposed to offer microcredit to members of the local communities in exchange for a commitment to stop extracting natural resources from the Park. To monitor compliance with these agreements, patrols and law enforcement activities were conducted. Park rangers were trained in the use of the SMART (Spatial Monitoring and Reporting Tool) software to improve patrol performance and monitor project results.

Implementation approach

Beneficiaries

The microcredit project began in 2010 in the village of Bugobe, a community bordering the Tshivanga sector of the Park. The Wildlife Conservation Society (WCS) and ICCN launched the project including training in small business development and credit management. This initial phase of the project ran for five years in Bugobe village. In 2015 the project was expanded to an additional four villages, with expansion continuing through in 2018 to a total of 10 villages. Anyone living in the project villages could become a microcredit beneficiary on the condition that they became a member of the partnering community association or Community Conservation Committee (CCC). All backgrounds and genders were eligible so not to encourage illegal activity as a prerequisite to be a beneficiary. Wherever possible, former hunters/poachers, charcoal producers, and bamboo collectors were offered the opportunity to become beneficiaries. This was in an effort to maximize the impact of the project by positively

changing people's livelihoods, decreasing illegal activities and helping people transition towards legal, sustainable activities.

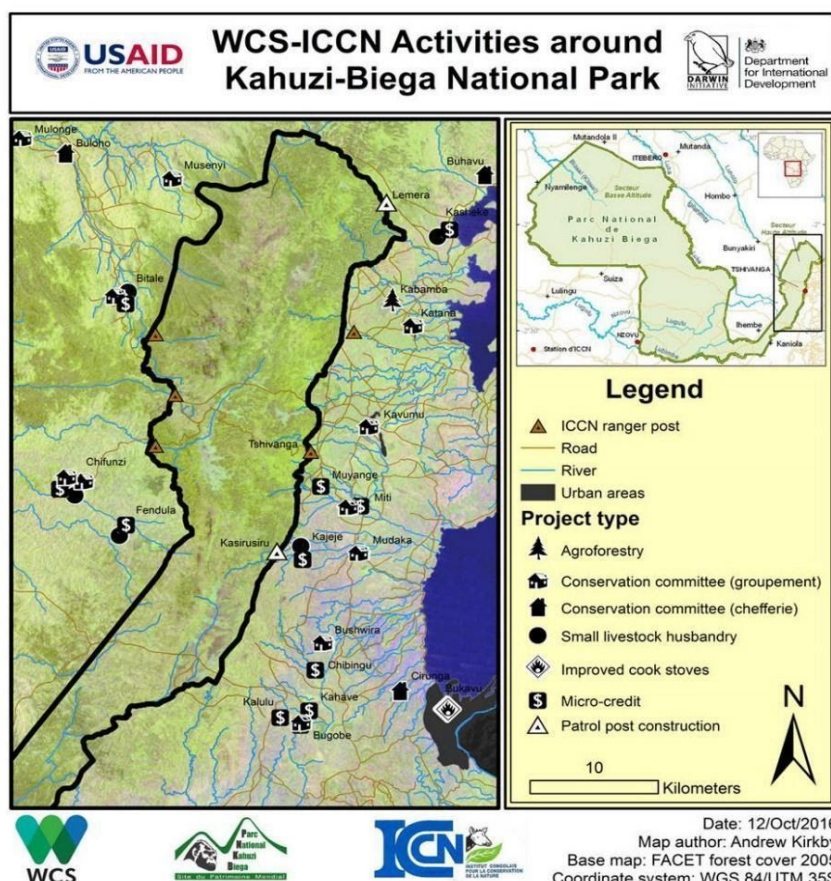


Figure 4: Location of the villages (outlined by a "\$") around KBNP where the microcredit project was implemented.

Seed fund

A microcredit project requires an initial seed fund – a source of finance from which the loans can be given. WCS, thanks to the CARPE grant, has been the main provider of this funding, but important financial contributions were also made by Fauna and Flora International (FFI) and United Nations Environment Programme (UNEP). For the first six years of the project, this fund was held in a local bank. However, in late 2016, several banks in South Kivu were forced to close (due to embezzlement of funds by bank managers). To protect the fund, the money is now held and directly managed by WCS. It is envisaged that local banks could be used in the

future, but this would require robust checks and balances, and regular monitoring of the bank accounts by the project administrators.

New funds were injected into the project periodically throughout the nine years, primarily because the geographic expansion undertaken in the second half of the project required a larger seed fund, but cash injections were also required to address the losses incurred from repayment rates below 100%.

Sustainable, self-financing credit cycles

The principle underlying the functioning of the project was that the intervention would operate on sustainable and self-financing repeat cycles – that is to say that starting with the initial fund, a cycle would begin with loans given to beneficiaries, repayments would be received, replenishing the fund, then a new cycle could begin with a second round of loans. In this way, the microcredit project could act as a “revolving fund”, providing a sustainable source of finance for the communities involved.

Governance

WCS and ICCN built on their existing partnership in KBNP and acted as the administrators of the microcredit project. Collaboration agreements were then formed with local, village-based *community associations*. In villages where there were already pre-established community associations capable of fulfilling a governance role in the microcredit project, collaboration agreements were formed directly with these already existing associations, with the intention of channeling the microcredit project through existing community structures. This was the case in Cibingu village (where the Local Development Committee was used), Miti (Muzusangabo Women's Collective), Kalehe (United Farmers for Integrated Rural Development), and Kalonge (Women's Management Centre, “CEF”).

In villages where there was no pre-existing community representative structure, WCS supported the creation of Community Conservation Committees (CCCs). These CCCs were to play two roles: they would consist of a *committee* that would provide the governance function, as well as also serving as a *membership organization* for the wider community. In order to become a beneficiary of the microcredit project, a villager would need to be a *member* of the CCC or community association.

Within each community association (be it an existing structure or a newly formed CCC), a sub-committee was created to directly supervise the management of the microcredit project in the village – the Microcredit Management Committees (MMCs). Under the supervision of the CCC (and overall oversight of WCS and ICCN as project administrators), the local MMC would issue calls for credit requests, take decisions on the granting of loans, set the repayment terms and collect the repayments.

Successful applicants became the microcredit beneficiaries, and signed a contract with the community association, committing to the conditions of the loan and the repayment terms. Collectively the microcredit beneficiaries formed a *community support group*. These groups could provide experience and advice on the management of the microenterprises the beneficiaries pursued, as well as acting as a source of “peer pressure” to encourage repayments. Failure to repay would impact negatively on the amount of loans that could be given in upcoming loan cycles.



Figure 5: Governance structure of the microcredit program.

Credit conditions

Loans between US \$100 to US \$200 were available. Loans could only be used to finance activities that served as an alternative to the illegal extraction of natural resources. Beneficiaries

had to agree not to extract resources from the Park and this commitment was specified in the loan agreement. Beneficiaries that broke the terms of their agreement would be liable to be sanctioned by their community association and the KBNP management, using authority under Law 14/003 of 2014 on nature conservation.

Between 2010 and 2014, beneficiaries were given 15 months to repay their loans. This was changed to 12 months in 2015 because the CCCs, WCS, and KBNP estimated 15 months was too long. If beneficiaries opted to repay their loans in less than the standard 12 months, they could apply for a new line of credit as soon as the repayment is completed. Beneficiaries who repaid their loans on time, and in compliance with the terms of the agreement, would become eligible to receive larger loans in future credit cycles. In addition to simply providing a line of credit, WCS and ICCN trained the beneficiaries in small business development and credit management to maximize their chances of success.

At the beginning of the project, in an effort to minimize the burden on beneficiaries, an interest rate of 0% was charged on all loans. However, the administration of the loans incurs a cost. Until 2014, the MMCs were using the fund's capital for the costs associated with repayment follow-up from beneficiaries. This was reducing the amount of capital available for future microcredit cycles. If this had continued it would have led to the ultimate depletion of the capital fund, thereby rendering the project unsustainable. Therefore, in 2014 a low-interest rate of 5% was applied to all future loans, enabling the MMCs to finance the costs of administering the project, while keeping costs to beneficiaries low.

Targeting of credit towards guinea pig projects

In 2016, WCS launched a complementary alternative livelihoods project in the communities surrounding KBNP. The guinea pig project was created to help meet the demand for animal protein in local communities while reducing pressure on bushmeat hunted in the Park. Participants in the guinea pig project need seed capital to kick-start their new farming initiatives. Therefore, a special line of credit was set up within the microcredit project, specifically targeted towards supporting the new guinea pig farmers. Many of the new villages into which the microcredit project expanded in the second half of the project's lifespan, involved specific targeting of "guinea pig credit" beneficiaries. These beneficiaries were also trained in guinea pig breeding techniques and were given technical support by the *Union des Eleveurs des Cobayes au Congo* (UECCO).

MEASUREMENT OF RESULTS

Performance of microcredit cycles

Repayment of the loans is monitored at different levels. The first is the community association: beneficiaries make their repayment directly to the President of the association who gives them a receipt, makes a photocopy and fills a reimbursement sheet. S/he then deposits the money with the Treasurer of the association and receives a global receipt of the amount refunded by the entire support group. The treasurer fills in a form with data on all the reimbursements from each support group. The second level of repayment monitoring is the Microcredit Management Committee. The MMC is responsible for resolving any disputes between the community association President and the Treasurer. The MMC comprises of five members: the President, the Treasurer, and three other members. Two members of the MMC must be present to deposit the money in the bank, and they keep records of the deposits. The third level of verification is done by WCS and the KBNP management team, who check that the bank balance matches what has been reported by beneficiaries. The performance of each microcredit cycle is thereby measured by the community association, the MMC, and by WCS and KBNP.

Figure 6 shows the cash flows in Bugobe between 2010 and 2018, as an example of how the performance of the microcredit was evaluated. The red boxes represent the amount granted to beneficiaries at each wave and in blue above what has been invested by donors. The amount written in red is what was repaid by the beneficiaries, and in grey what was used for management. Grey boxes represent the money available in the bank between each round.

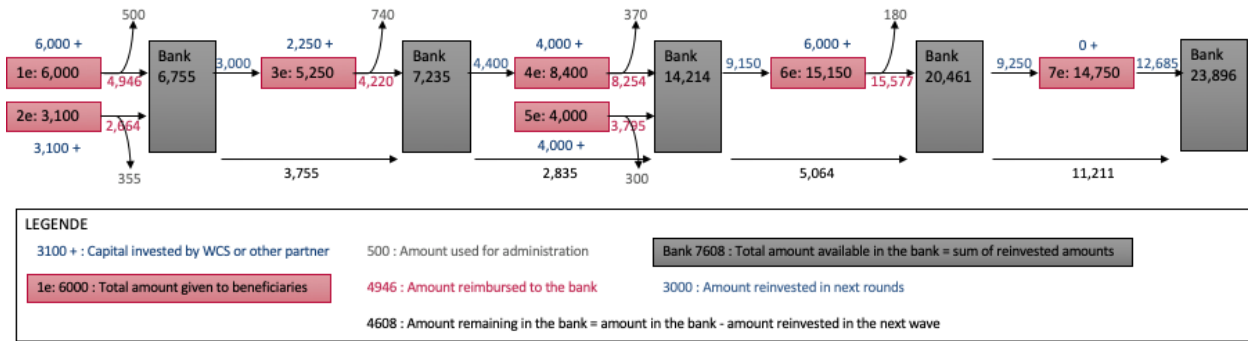


Figure 6: Microcredit operations in Bugobe since the first round of 2010. In Total, about \$56,000 was given in loans, with an average reimbursement rate of 89% in Bugobe.

Measuring illegal resource use into the Park

SMART is open-source software that allows protected area managers to measure, evaluate and improve the effectiveness of wildlife law enforcement and on-site conservation activities. After rangers conduct patrols, the data they collect on smartphones can be downloaded onto a computer and analyzed. WCS trained ICCN Park rangers in the use of smartphones and how to record human and animal activities that they encountered on their patrols. The patrol effort per year was measured by the number of patrols and the number of kilometers – with the data aggregated into a grid of cells and mapped using a Geographic Information System (GIS). The data collected on illegal activities were analyzed aggregated and mapped into a grid of 6.25 km² cells.

Subsequent analysis of this data enables a visualization of the illegal resource use into KBNP – a central objective of the microcredit project. However, it is very difficult to attribute illegal resource use decline to socio-economic projects for various reasons. Poachers do not necessarily come from the intervention villages and may come from far, getting their identity (when they are actually being arrested) is challenging as they do not have their IDs, lie about their name or where they come from, and people do not know how to spell names properly.

Measuring deforestation

Deforestation in KBNP can be assessed using data from the Global Forest Watch online platform (www.globalforestwatch.org). Global Forest Watch provides maps of areas where the loss of forest cover is more than 30% of canopy density between 2001 and 2017. It enables changes in tree cover to be analyzed in detail for a selected geographical area. Their online tool calculates the changes in the tree cover in a user-specified area of interest and displays the results of the calculations. The data displayed includes the total area selected by the user, the

loss of forest cover, gain in forest cover and the baseline data of forest cover measured in 2000.

The same area as the SMART data was used to calculate forest cover loss. The map was analyzed to identify the location and intensity of deforestation in the accounting area. As patrols are only conducted inside the Park, and information on deforestation in the buffer zone is also a relevant result to the microcredit project, a 5 km buffer zone around the northeast sector was also analyzed. These graphs were used to measure whether the microcredit solutions implemented had an impact on deforestation.

Measuring poverty reduction

Poverty reduction in the project was measured by assessing the well-being of households participating in project activities. Their well-being was measured using the Basic Necessities Survey (BNS). The indicators used to measure the level of well-being are determined by the communities themselves and reflect local and traditional circumstances. This approach assesses the well-being of communities that are not well integrated into formal markets or mainstream society. Further details on the calculation of the BNS and the welfare index are available in Appendix I.

RESULTS

Delivery of microcredit

Between 2010 and 2018, the project delivered microcredit across 10 villages to 1,326 beneficiaries: 501 men and 825 women, including 12 indigenous people and 398 former poachers. The total credit granted to beneficiaries was US \$145,415. Table 1 shows the number of beneficiaries per year and per village, Table 2 shows the amount of credit granted and Table 3 shows the loan repayment rates.

Table 1. Number of beneficiaries per village per year from 2010 to 2018.

Year	Village										Total
	<i>Bugobe</i>	<i>Cibingu</i>	<i>Kajeje</i>	<i>Kalehe</i>	<i>Miti</i>	<i>Bitale</i>	<i>Cifunzi</i>	<i>Fendula</i>	<i>Kalonge</i>	<i>Kasheke</i>	
2010	60										60
2011	31										31
2012	47										47
2013	64										64
2014	40										40

2015		30									30
2016	135	63	30	30	30						288
2017				35	50	30	30	30	30	30	235
2018	118	205	60	35	53					60	531
Total	495	298	90	100	133	30	30	30	30	90	1,326

Table 2. Amount of microcredit granted (in US \$) per year per village from 2010 to 2018.

Year	Village										Total
	<i>Bugobe</i>	<i>Cibingu</i>	<i>Kajeje</i>	<i>Kalehe</i>	<i>Miti</i>	<i>Bitale</i>	<i>Cifunzi</i>	<i>Fendula</i>	<i>Kalonge</i>	<i>Kasheke</i>	
2010	6,000										6,000
2011	3,100										3,100
2012	5,250										5,250
2013	8,400										8,400
2014	4,000										4,000
2015		3,000									3,000
2016	15,150	6,450	4,350	3,000	3,000						31,950
2017				4,500	4,500	4,350	4,500	4,500	3,000	4,500	29,850
2018	14,750	11,900	9,000	4,500	4,715					9,000	53,865
Total	56,650	21,350	13,350	12,000	12,215	4,350	4,500	4,500	3,000	13,500	145,415

Table 3. Microcredit repayment rates by village and year for 2010 to 2018.

Year	Village										Mean
	<i>Bugobe</i>	<i>Cibingu</i>	<i>Kajeje</i>	<i>Kalehe</i>	<i>Miti</i>	<i>Bitale</i>	<i>Cifunzi</i>	<i>Fendula</i>	<i>Kalonge</i>	<i>Kasheke</i>	
2010	82%										82%
2011	86%										86%
2012	80%										80%
2013	94%										94%
2014	90%										90%
2015		48%									48%
2016	98%	90%	39%	100%	100%						88%
2017				100%	100%	0%	0%	0%	40%	0%	34%
2018	82%	23%	33%	15%	45%					82%	52%
Mean²	89%	47%	35%	68%	79%	0%	0%	0%	40%	55%	63%

In 2015 and 2017, Bugobe village did not receive any loan due to accusations of misappropriation that had been made to the MMC, which resulted in the community

² The means are taking into account the amount of each loan.

association putting a halt to the disbursement of loans in these years. In Kalonge, the low reimbursement rate was due to the CEF that had secretly decided to use US \$800 from microcredit to buy community land in order to use it to earn more money.

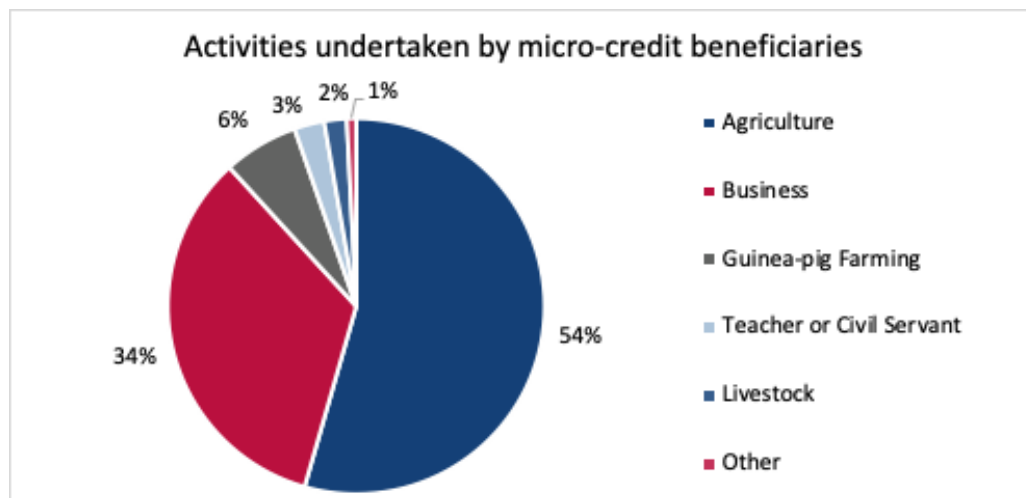


Figure 7: Distribution of activities carried out by microcredit beneficiaries.

As shown in Figure 7, microcredit was mainly used to create small businesses, purchase agricultural inputs and raise guinea pigs. Guinea pig breeding was first introduced in December 2016 in Kajeje and then in 2017 in Cifunzi, Fendula, Bitale, and Kasheke. WCS actively promoted this business opportunity to meet protein demand and reduce consumption of bushmeat. The main activities pursued by microcredit beneficiaries are presented in Figure 7. 54% of the beneficiaries were involved in agriculture (for subsistence and trade, including cassava, beans, and other vegetables) 34% in trade, 6% in guinea pig breeding, and 2% in other types of animal husbandry.

Illegal resource use

Figure 8 shows the categories of illegal activities encountered during patrols. Poaching and timber collection in the Park represent nearly 80% of the illegal activities encountered. The remaining 20% of illegal activities consist of mining, fire setting, agriculture, grazing, and collection of non-timber forest products (NTFP) and bamboos. There is no clear trend and the percentages of each category vary slightly from year to year.

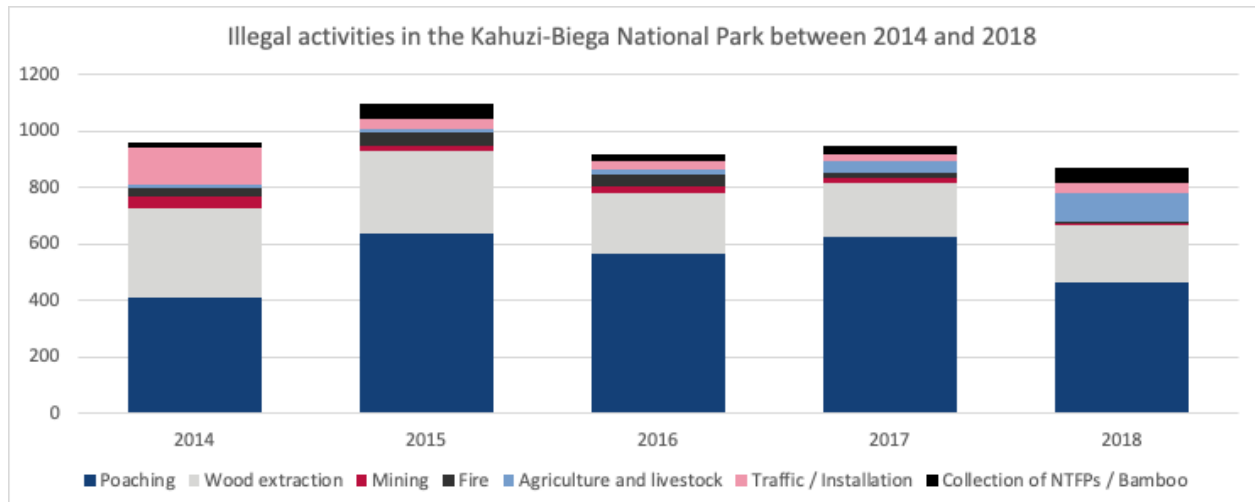


Figure 8: Illegal activities in KBNP; the largest activities registered include poaching (blue) and wood extraction (grey).

Figure 9 shows the frequency of illegal activities recorded in the Park overlapped with location of micro-credit beneficiaries. The data are consolidated in 6.25 km² cells and summarized for the periods 2012-2014 and 2015-2017. Villages with beneficiaries are represented by green circles. The comparison of the two periods shows some trends.

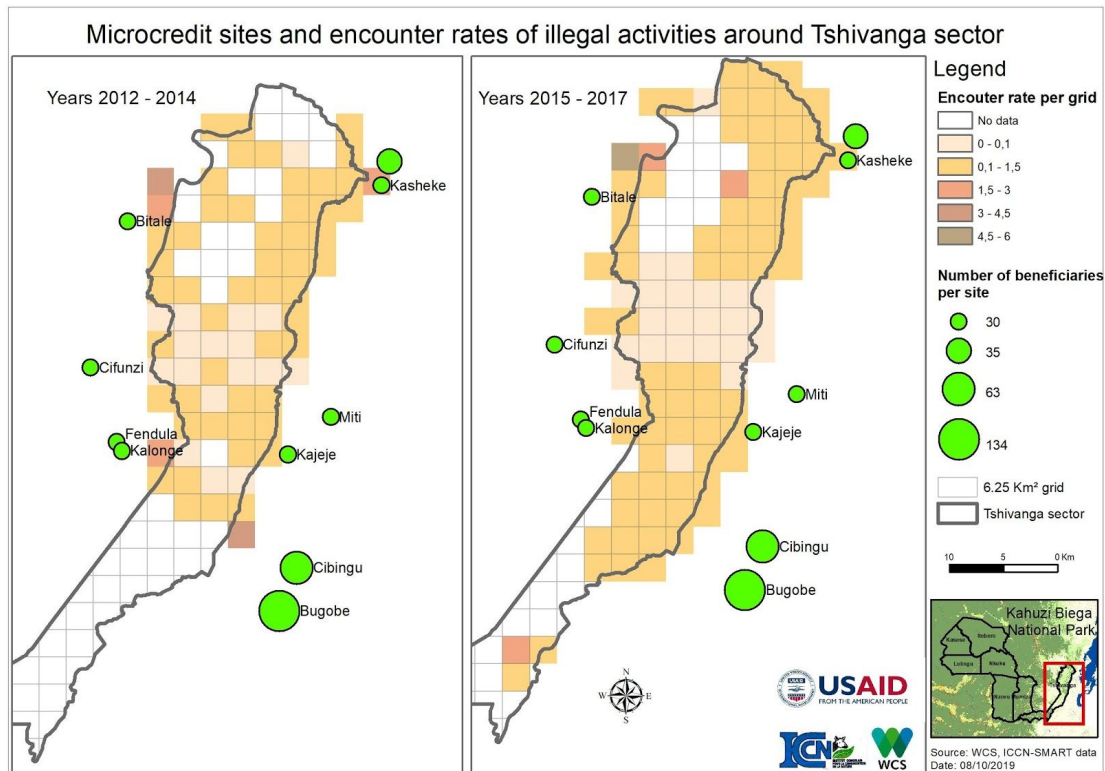


Figure 9: Spatial coverage of illegal activities and villages benefiting from microcredits.

There is a slight downward trend in illegal activities around the microcredit sites. It is important to note that mining activity has greatly increased around the north of Bitale. The white cells mean that there were no patrols there. The increase of mining is related to the discovery of new mining sites around Bitale. Indeed, the microcredit scheme did not target miners around Bitale as WCS studies have shown that microcredit may not be a solution for mining activities.

Figure 10 and Table 4 show the distribution and patrol effort between 2014 and 2018 in the southeastern sector. During these four years, more than 10,000 patrols were carried out covering a total distance of nearly 53,000 km. Patrol distance has more than doubled from 2015 to 2017 compared to 2014, with an average of 7,049 km and 15,000 km, respectively. Most patrols are deployed through the two main roads that cross the sector. In 2015, patrols along the eastern border of the sector increased and, in 2016 and 2017, their intensity shifted from the eastern side to the northern side of the sector.

2014

2017

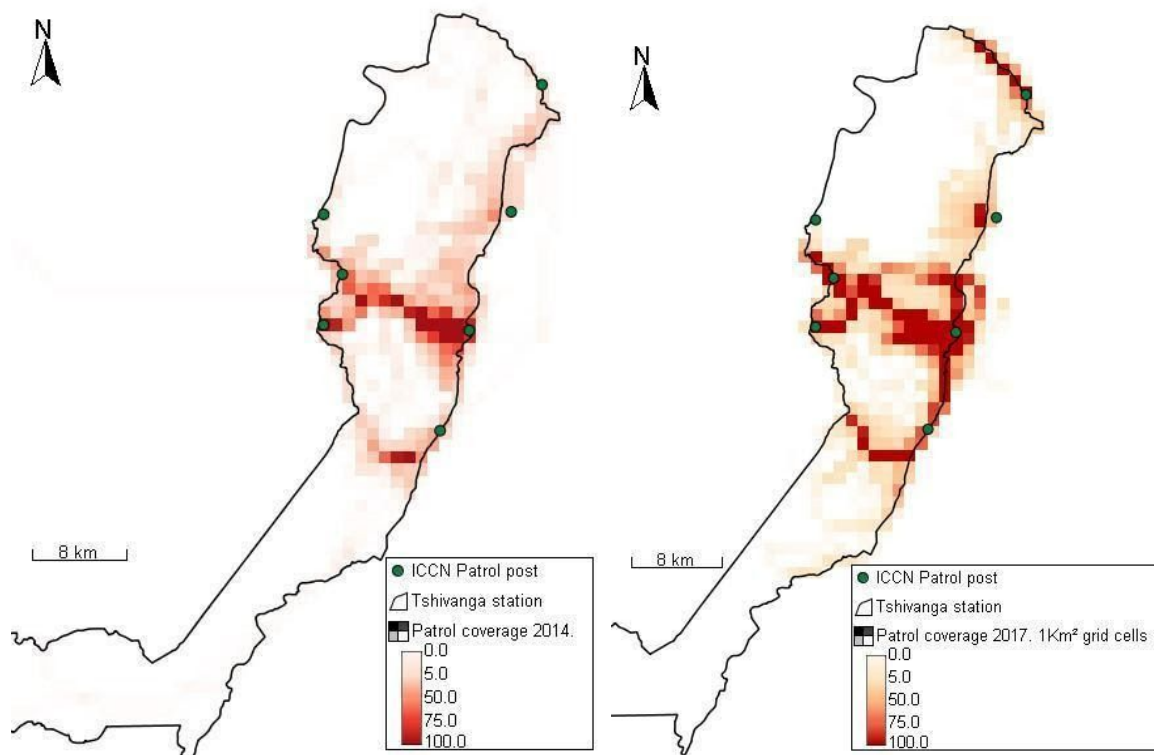


Figure 10: Spatial coverage of patrols in the Park in 2014 and 2017.

Table 4 Patrol effort per year in the southeast sector

Year	Number of patrols	Distance (km)
2014	2,645	7,049
2015	2,346	15,461
2016	2,354	13,848
2017	2,755	16,434
2018	1,020	7,478
Total	11,120	60,271

Deforestation

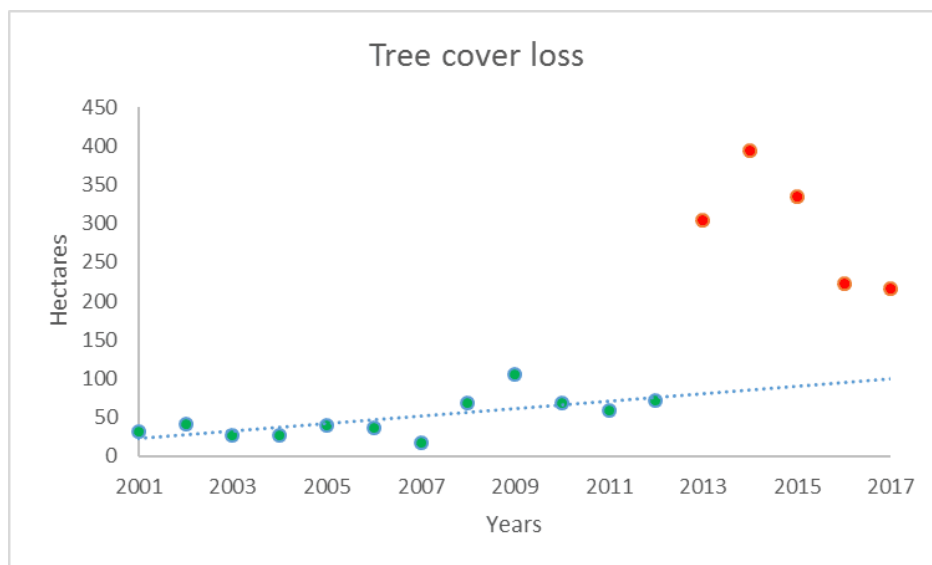


Figure 11: Deforestation rate in hectares per year since 2001

In 2000, the total forest cover in the accounting area was 50,748 ha. The forest cover lost from 2001 to 2017 was 2,074 ha over 16 years, or 4.1%. Nearly three-quarters (71%) of the 2,074 hectares of lost forest cover occurred in the last 5 years (2013-2017).

Before 2013, average annual deforestation was 49 ha per year. After 2012 until 2017, forest cover losses increased sharply to almost 300 ha per year (295 ha). This represents an increase of 6 times. Figure 9 shows the sharp increase in forest cover loss before (blue dots) and after 2013 (red dots).

A main forest cover loss site in the area of interest has been identified in the south (circled). In addition, two deforestation boundaries have been identified outside the Park (red arrows): 1) south of Bitale and 2) north of the Park.

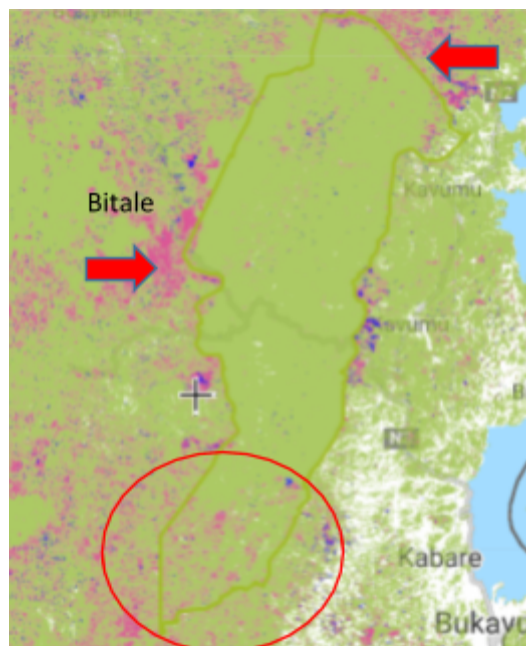


Figure 12: Distribution of deforestation around the southeastern sector.

Poverty reduction

Figure 13 shows the well-being index (WBI) of beneficiary and control households around the KBNP since 2015. It is important to note that the sampling of ordinary credit recipients in 2015 was very small (20 households), and the result is probably not representative. The guinea pig microcredit had not started in 2015. After a sharp drop in WBI between 2015 and 2017, there is a linear increase for ordinary credit recipients between 2017 and 2019. The WBIs of guinea pig credit beneficiaries increased between 2017 and 2018, but decreased again in 2019, to a level that is still higher than 2017. For households that received no support ("controls"), their WBI increased between 2017 and 2018 about as much as ordinary credit recipients, but less than guinea pig credit recipients. Between 2018 and 2019, the WBIs of controls have decreased again.

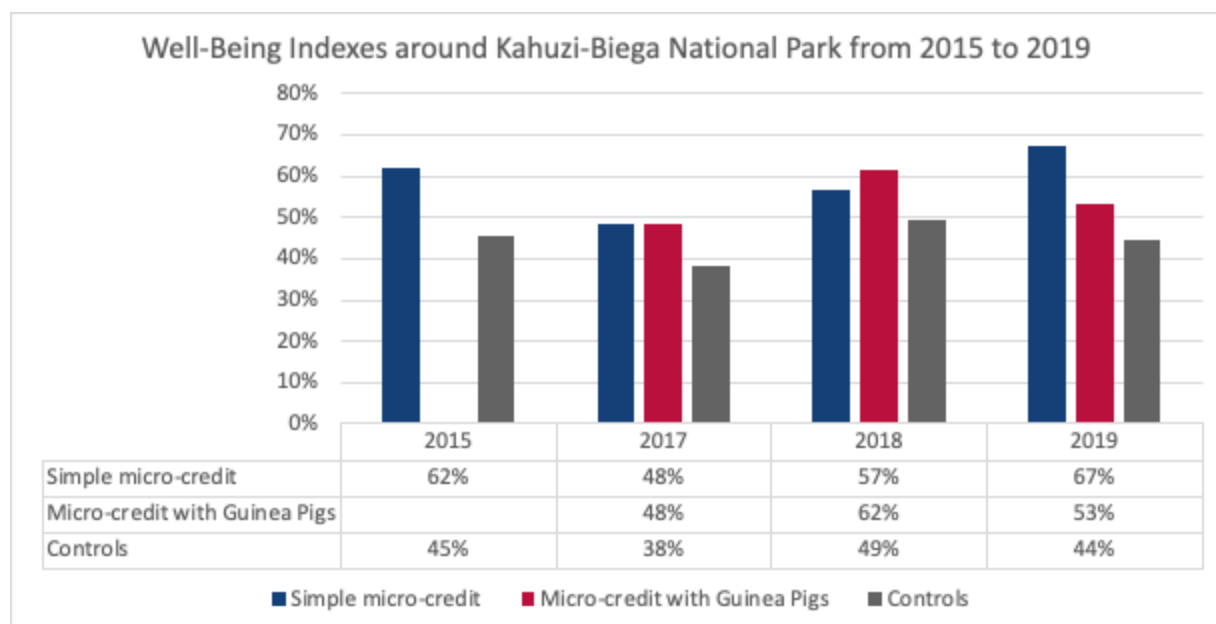


Figure 13: Well-being indices around the KBNP since 2015.

DISCUSSION

Microcredit

The microcredit project has expanded over the past four years, from one village, Bugobe, to a total of ten villages. There was a clear demand for microcredit and local communities were willing to join the community associations and take on the risk inherent in debt in exchange for committing to wildlife conservation objectives. In total, more than 1,500 households benefited

from this project since 2010, 30% of which were previously engaged in illegal activities. However, the number of beneficiaries is still low compared to the population living around Kahuzi-Biega National Park. In order to have a greater impact on the reduction of illegal resource use, the project should be expanded.

Expanding the project should be done with precaution. Despite the rapid adoption of microcredit within and between villages, repayment rates have fluctuated since the beginning of the project and continue to be inconsistent. Moreover, even when repayments rates were low, the project continued to give loans in those same villages : communities learnt that debt repayment was not strictly enforced, which can partially explain the high adoption rate of microcredit. Due to inconsistent oversight standards, debts were amortized and it increased people's willingness to take on debt when default was not penalized.

It is therefore necessary to enforce repayment and sanctions when the microcredits are not being reimbursed. Support groups and villages who did not reimburse at all their first rounds of microcredit probably should not have been beneficiaries again so early. Other communities should have been targeted to set an example. The strict adherence to the number of months as the cycle limit was a weakness as it encouraged amortization – an alternative to this would be to force a village to achieve a minimum repayment rate (regardless of the time taken) before starting a new loan cycle.

Another option would be to increase interest rates to recover outstanding debt and maintain community working capital at the same level. For example, in Cycle 6 of Bugobe, an interest rate of 3% is required to recover the US \$450 with a repayment rate of 97%. To cover the outstanding debt of US \$2,500 from the first round of US \$6,000 with a repayment rate of 58.3%, the interest rate should have been 71.4%.

In addition to the above proposal, it is advisable that facilitating structures consider successful initiatives from beneficiaries. For example, the Miti community group have been using two different integrated approaches that combine social capital (building relationships among members by either visiting members in the hospital or assisting members for burial from the interest generated by the group) and equitable financial capital where all members have access to credit based on their need. In addition, to secure their capital, nobody keeps cash from the group. By the day of reimbursement, the group should have identified beneficiaries. Therefore, rotative visits to members has been used as part of the monitoring of members in case they have delayed to reimburse or been irregularly attending meetings.

Better supervision and a strong monitoring system are necessary for the micro-credit project to be successful and to avoid inappropriate use of microcredit. This is highlighted by the very low repayment rates of Kajeje (28.8%) and Kalonge (39.6%). With an adequate system in place, CEF members could never have improperly used the US \$800 to pay for a community plot. Adequate supervision is also required when borrowers engage in a business with which they are not familiar, in this case, farming guinea pigs. In general, an investment is considered higher risk if the borrower does not have sufficient knowledge and skills to develop the company of his choice.

In the cases of micro-credit combined with guinea pigs, low repayment rates are in most cases due to the low success rate of this livestock farming. The guinea pig association provided little support and follow-up to borrowers. As a result, the number of guinea pigs raised for sale was insufficient due to the high mortality rate (disease and famine) and the income available to repay the loan was not sufficient.

The 100% repayment rates in Miti and Kasheke is explained by the fact that the management did not go through CCCs but through structures that had been put in place for several years by the villagers themselves. They do not only come together to talk about microcredit but about all the activities organized within the structure. They also were able to leverage the experience of projects carried out by other NGOs over the years. These structures, Collectif Muzusangabo and PUDRI, are well organized and independent, with very committed members who strive to raise awareness, unlike CCC members who are new, do not necessarily understand their role and are less involved.

After almost 10 years of managing this micro-credit project, the WCS socio-economic team now has a much better understanding of how it should be monitored. One important challenge was that the expansion of the project was not followed with increased resources to set up a proper monitoring system, and more capacity building is required for administrators of the microcredit.

SMART

Overall patrol data showed that poaching and timber collection were the main illegal activities committed in the patrol area. Illegal activity decreased in 5 out of the 10 project sites. Around these villages where illegal activities decreased, this cannot necessarily be solely attributed to the microcredit system – increased patrolling efforts in the beneficiary areas could also have had a deterrent effect. This could be exacerbated by the fact that currently, the proportion of

beneficiaries in the community is quite low. SMART data, in general, can identify trends that are not only related to the microcredit system. It is also difficult to draw reliable conclusions based on SMART data as patrols did not cover the project area in a consistent way since it started.

Deforestation

Deforestation in the southeastern sector of KBNP has increased six fold since 2012: from 50 to 300 ha per year. Deforestation decreased slightly in 2016 and 2017 (280 ha on average per year) compared to 2013, 2014 and 2015 (345 ha on average per year).

The results identified two areas of deforestation in the Park's buffer zone – to the north of the Park and to the west around Bitale. The concentration of patrols in the north has been in response to this increasing pressure on the Park. At present, these pressures are due to the high demand for wood and charcoal from the city of Bukavu. The city of Bitale, to the west, is also known for its timber processing and extraction, which also supplies Bukavu. More recently, mineral exploitation has also increased pressure in the northern part of the Park.

A third area of deforestation is found inside the Park, in the corridor that links the eastern sector to the other sectors. Most forest cover losses are recorded on the west side of the corridor, suggesting that the drivers of deforestation come from the west side of the Park. Deforestation in that area is due to the illegal settlement of farms. In the last 12 months, law enforcement operations have been successfully carried out by ICCN to evict illegal farms from this corridor, reducing pressure on this part of the Park.

The microcredit project was set up to answer a need for cash to replace illegal resource use inside the Park, however, deforestation is not only driven by economic reasons. The demand for fuel and timber is very high, with no alternative available than the wood from inside and around the Park, and micro-credit cannot replace that need for fuel. This project on its own can solve the need for cash, but other projects should be addressing the demand for charcoal and timber.

Poverty alleviation

Do differences in well-being indices (WBIs) between control and microcredit beneficiary households show that microcredit reduces poverty? Observations from the BNS data show that the average WBIs of control households is around 40%, whereas in households benefiting from microcredit they are between 50-60%. This clear result suggests a strong correlation between the provision of microcredit and improved well-being.

While well-being rates in microcredit households in 2019 show marked improvement compared to the baseline, rates dropped momentarily in 2017. This drop can likely be attributed to several factors. Firstly, the expectations of respondents will have increased between the baseline and the next survey – including expectations for new technologies that are increasingly seen as basic necessities, while access to services has decreased in eastern DRC (inflation during this period increased the prices of goods and services, making them more difficult to access). In addition, since this region of DRC has experienced repeat periods of insecurity, it is likely that survey participants lie about what they own for fear of being robbed. Finally, the other factor that can push participants to mislead researchers is that other NGOs present in the area tend to make large, no-strings-attached donations to individuals or communities. Some people therefore think it is better to say that they have nothing and hope to receive charity in return – skewing the BNS results. However, after this fall in 2017, the WBIs of microcredit recipients have increased significantly since 2017. This suggests that microcredit does have a positive impact on well-being and reduces poverty.

WBIs of guinea pig credit beneficiaries, which increased in 2018, decreased in 2019. This is probably due to various difficulties encountered with guinea pig breeding and the mediocre success rates of guinea pig farms. As guinea pig farming only accounts for 6% of the loans given, this has a marginal impact on the overall well-being results.

CONCLUSION

While many beneficiaries started successful microenterprises, the results of the microcredit project are mixed. Difficulties were encountered with corruption, poor management standards and low repayment rates. The absence of robust control mechanisms and high management costs at the beginning of the project hindered performance. To address these challenges, mechanisms to build capacity and improve management standards were put in place.

Microcredit alone cannot address the drivers of deforestation and need to be combined with interventions targeting the demand for charcoal and timber. Agroforestry for wood production and/or improved stoves could address the need to reduce of charcoal production and slash-and-burn farming. Agroforestry plots have been planted in 2017 to provide fuelwood to limit villagers' incursions into the Park, and these plantations will mature in 2021. Ideally, communities around the Park should be trained in climate-friendly farming practices to increase their yields and avoid the need to clear more forests in the future. These two measures will reduce the demand for new arable land and allow land to be set aside for reforestation.

Since 2016, to reduce the threat of hunting, households were offered microcredits combined with an opportunity to farm guinea pigs as an alternative source of protein. Some beneficiaries have failed to make guinea pig farming a viable business, which has been attributed to insufficient support from the business development service provider and some misuse of the loan. Combating the threat of bushmeat hunting can only be successful if guinea pig farms are well established and able to meet the demand. This means providing better technical support, helping livestock producers sell at good prices, especially at mining sites, and refinancing those that are successful. It is also recommended to combine guinea pig breeding with other income-generating activities that the beneficiaries have already mastered.

In summary, microcredit does have the potential to stop illegal activities in Kahuzi-Biega National Park while contributing to poverty reduction, but only as part of an integrated package of solutions that tackle the multiple threats that the Park faces. It is unlikely that the decline in illegal activities seen in some project areas was due solely to the provision of microcredit loans, as increased patrol effort will have deterred people from entering the Park and engaging in illegal activities. In addition to being a somewhat isolated solution, unable to tackle the myriad of threats the Park faces, the microcredit project was also too small to have a meaningful

impact on threat reduction. Greater impact could be delivered by expanding the area of geographic implementation, ensuring that more robust monitoring and enforcement systems are in place and combining microcredit with other intervention strategies.

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APPENDICES

Appendix I: BNS Methodology

The metrics are determined through group discussions that are subdivided into "older men" and "older women", "young men" and "young women" in order to capture the gender and generational aspect of basic needs. The list of basic necessities is determined by classifying products or services into five categories: products/services accessible to all (1), half (2) or only a few (3) people; items that are now considered a "luxury" but can become basic necessities (4) and items that are a basic necessity in cities (5). The needs identified by these discussions can range from access to clean water, two meals a day, television or medical care.

From these discussions, a master list of basic necessities is established and will serve as the basis for the survey. The survey follows standard sampling procedures in which beneficiaries are compared to a control group. During the interview, respondents are asked: 1) if they have or have access to the goods and services listed (yes = 1, no = 0), 2) if these goods or services are really necessary, and 3) how many goods they own.

Household well-being is only analyzed in relation to those elements (goods and services) for which more than 50% of households have confirmed that they are really necessary. All the elements for which less than 50% of households really needed were not considered a basic necessity. In addition, not every item was considered equally important, for example having a radio is considered less necessary than having two meals a day. As a result, the articles also have a different weight of less than 1 and range from 0.995 to 0.743, for example.

Each score (yes = 1 or no = 0) is multiplied by its weight. All calculated scores are added together, i.e. the household well-being score. The household well-being index is the ratio between the actual household score and the maximum possible score converted into a percentage (%). The scores of target and control households are compared statistically to assess whether the project activities or interventions increase well-being, i.e. contribute to poverty reduction.