case study

Measuring impact and cost benefit: a Sudanese case study

Overview

This case study aims to address calls for more rigorous evidence-based research on the costs and benefits of disaster risk reduction (DRR) interventions at the community-level. The International Federation of Red Cross and Red Crescent Societies (IFRC) is attempting to narrow this gap by building an evidence-base for DRR activities which are replicable, scalable and applicable in various settings and contexts. It will highlight the impacts, costs, benefits and economic efficiency of community-based DRR. This study was undertaken to assess the impact and cost-benefit analysis (CBA) of DRR programming in three communities in the Red Sea State of Sudan. Specifically, the study's objectives included:

- Identifying the qualitative and quantitative impact of the programmes that have contributed to community safety and resilience.
- Defining a set of community-based indicators regarding resilience.
- Developing a CBA of the risk reduction initiatives implemented under the programmes.

General context

The Red Sea State of northeastern Sudan covers an area of approximately 218,887km^2 and is home to the country's main seaport, Port Sudan. It is one of the most highly populated states in the country, with an estimated population of 846,000 persons,[1] while overall poverty rates for the state are at a staggering 65 per cent.

The Red Sea State is also home to the Beja, the state's indigenous tribe. The Beja, composed of four groups, the Amara, Beni Amir, Busaharien and Hadandawa, are mainly nomadic agro-pastoralists. The Beja livelihoods system is a direct consequence of their environmental constraints, including variability in rainfall, water scarcity and extreme temperatures. Traditionally, the Beja have developed a series of strategies that attempt to achieve optimal use of meager and seasonally variable resources in their environment. These strategies include mobility, herd diversification and redistribution. However, in

1 https://www.odi.org.uk/ressourcesdownload/601.pdf

recent years, persistent and prolonged droughts and food crises in addition to environmental degradation and desertification have forced many to abandon their nomadic lifestyle and to migrate to settlements located in the outskirts of urban centres in search of work.

Within this context, the Sudanese Red Crescent Society (SRCS), with the support of the Danish Red Cross (DRC) and the Norwegian Red Cross (NRC), over the course of the past 20 years has developed programming aimed at reducing the vulnerability of the Beja nomads to recurrent droughts and to protect, where possible, the assets that communities have in order to build resilience to natural disasters. Specifically, this study focuses on the projects initiated between 1986 and 1990 in response to the food security crisis faced by the Beja population living in the Greater Sinkat Province (Derudeb, Haya and Sinkat) of the Red Sea State. The projects have gone through various phases of design and implementation over the course of 20 years and are currently being carried out based on agreements between the SRCS, DRC and NRC.

The Sinkat Community Development and Derudeb and Haya Integrated Rural Food Security Projects of the SRCS have and continue to aim at re-establishing the means of subsistence for Beja nomads to prepare them and the environment to cope with future climatic extremes. This has included programming in the following sectors:

- food security/livelihoods
- health
- water
- education
- women's development.

Project specificities

Sinkat Community Development Project, which was initiated in 1986, focused on the development of earth embankments, dam construction and communal garden development.

The Derudeb and Haya Integrated Rural Food Security Project was initiated in 1990 focused on environmental health; rehabilitation; construction of wells; activities addressing availability, accessibility and utilization of water, land and foodstuffs; as well as capacity-building in rural communities and skills and income generation development in women's centres.

Methodology

Fieldwork was conducted in 11 villages and towns within the Derudeib, Hay and Sinkat localities over the course of 20 days in 2009. Data was collected from the three localities through meetings and in-depth discussions with focus groups, SRCS programme staff, Red Sea State Branch personnel, DRC and NRC representatives, local authority personnel, line ministries and community members.

To the extent possible, all efforts were made to triangulate data in order to ensure accuracy and reliability.

This community-based CBA specifically compared two scenarios, the impact of hazards (drought) with or without DRR interventions, in order to determine the impact of DRR on the community, calculating the net benefits and costs that accrue from such interventions. The study highlights the relevant qualitative and quantitative impacts on the communities that undertook DRR interventions.

Analysis

Constraints regarding the compilation and analysis of existing data limited the number of CBAs that could be carried out during this study. Data gaps posed challenges to effectively capturing costs and benefits of interventions. These gaps included:

- quality and availability of primary data from the local communities
- high staff turnover
- poor archiving systems
- irretrievable documentation
- absence of secondary baseline or monitoring data

Additionally, given the multi-sectoral nature of these interventions, the impact and benefits of certain programmes could not be assessed. Particularly when addressing non-quantifiable (e.g., empowerment of women including women's centres) and non-monetisable (e.g., lives saved; increased education) benefits.

However, CBAs were carried out on four specific interventions:

- construction of terraces
- building of earth dams and embankments
- developing communal garden
- building a retention pond (*hafir*)

For each of these specific activities, the cost-effectiveness analysis factored in the initial investment as well as operations and maintenance costs. This was juxtaposed against benefits which were projected over the lifetime of the project (i.e., expected benefits to be accrued by communities over project's lifetime). A discount rate of ten per cent was assumed for all of the projects.

Results

The following provides a brief overview of the CBAs carried out on the four DRR related interventions.

Construction of terraces

The construction of terraces in Derudeib was designed with inlets and outlets in order to allow for water to enter and flow in controlled areas of agricultural production. These terraces support fruit and vegetable production and have provided a means for cash income for 3,680 households. The community supported is now able to engage in a sustainable livelihood and undertake

The Sudanese Red Crescent Society's rural food security projects have included community involvement in the rehabilitation of boreholes in South Sudan

important social obligations of sharing. An economically efficient investment, the cost-benefit ratio for this intervention is 1:61.

Building of earth dams and embankments

Earth embankments were constructed to control the flow of seasonal rivers and trap water for agricultural cultivation. The embankments in Lashob are made up of four packed earth structures that each stretch 2.5 km in length. Land within the embankment catchment is distributed annually according to the demand. All demands from community members are met – no one is refused land. Household in Lashob focus on the production of sorghum which is produced primarily for their own consumption and not sold in the market. Factoring in an annual drought probability of 40 per cent, the embankments have a cost-benefit ratio 1:2.4.

Developing communal garden

The development of communal gardens in Hamisiet, with a total cultivated area of 0.42 hectares is able to produce vegetables and fruit throughout the year as a result of an irrigation system. Households rotate working on the garden throughout the year and at any given point in time are able to retain 70 per cent of production either to earn as income through sales or for household consumption while providing 30 per cent of production to other community members. Communal gardens have therefore enabled households to build resilience to future disasters through increased social capital. Based on a ten year projection the cost-benefit ratio for the communal gardens is 1:1800.

Building a retention pond (hafir)

Essentially a large whole dug out in the ground that holds runoff water, from surrounding mountains. Runoff water is caught through a catchment that feeds into the hafir. This particular hafir was reported to be able to hold water for two to three years following a good year of rainfall. The hafir was built to provide water for the consumption of nomadic pastoralists their livestock. The hafir has reduced the loss of livestock and increased the health of animals by reducing the time they must travel without access to sufficient water. The hafir provides water annually whether a drought year is being experienced or not. Based on a 15-year projection, the cost-benefit ration for the retention pond is 1:2.7.

The benefit-cost ratio was calculated based on actual programme start dates, foreseen project life spans and data limitation. The benefit-cost ratios derived below were based on the sum of all benefits divided by the sum of all costs in today's values. Therefore, if a project costs USD 1 million but produces USD 5 million in benefits, the benefit-cost ratio is five. However, if these figures were reversed, the benefit-cost ratio would be 0.2.

As indicated in the table below, the resulting benefit to cost ratios for all four interventions were greater than one, thus indicating they were economically efficient community-based DRR programmes.

Location	Activities	Analysis Period	Benefit cost ratio
Al Maneer Derudeib	Constructing terraces to capture run-off for farming	2005-2015	>25
Lashob	Buidling earth dams and embankments to capture run-off for farming	2005-2015	2,4
Hamisiet	Developing a communal garden for dependable produce, increasing household income	2004-2015	>25
Delai	Building a retention pond (hafir)to provide water for people and livestock	2005-2020	2,7

Non-quantifiable impacts

Programmes which have been implemented but for which CBAs could not be conducted, due to data gaps mentioned above, have had a number of substantial qualitative impacts on the targeted Beja communities. Impacts are being realized in socio-economic, health and educational terms. The women's centers and education support, while proving difficult to provide a cost benefit

analysis for, appear to have the potential to have "generational" and societal impact. This is demonstrated by an increase in the number of girls attending school and an increase in those attending university. Equally women's centres provide possibility in gaining new skills and knowledge including in areas such literacy, health and nutritional awareness. These interventions have started to influence the Beja traditions and societal norms, for the better, and will continue to do so in the future.

In addition, the food security/livelihood interventions have increased access to food and income through the improved utilization of existing water sources. The improved utilization of water sources was achieved through local solutions and where possible low/appropriate technology solutions.

Interventions in support of the hospital in Derudeib have improved the treatment of tuberculosis, maternal and child health, as well as reducing pregnancy complications and maternal deaths. A key factor in reducing pregnancy complications and maternal deaths has been the outreach provided through the training and equipping of midwives to work at the community-level.

Key to the realization of the impacts described was the integrated, multi-sectoral programme approach adopted by the SRCS, engagement and ownership at the community-level and the long-term commitment of donors.

Challenges and lessons learned

Limitations in conducting an effective CBA included lack of systematic and consistent monitoring and reporting during longer-term programming, high staff turnover and poor archiving systems. A number of issues arose during the study that suggests undertaking retroactive CBAs is complicated and may be unreliable as a study tool. These issues include:

- Where integrated multi-sectoral programming is undertaken it is **difficult to compare cost efficiency between the different interventions**, however it is possible to measure the cost efficiency of the whole programme.
- In the **absence of direct linkage between CBAs and programming decisions** National Societies are unlikely to undertake such studies as routine. Investment should be geared towards **basic monitoring and evaluation skills.**
- The **CBA was unable to quantify the social benefits accrued** as a result of interventions. Social obligations and kinship are an important part of life among the Beja population and therefore the inability to quantify social impacts severely under-estimates the benefit accrued as a result of the interventions.
- **CBAs can be used to help design economically efficient programmes** and activities.
- When **retro-active CBAs are planned it will be necessary to ensure that appropriate baselines and tracking systems** are set up prior to programme implementation in order to facilitate access to the necessary disaggregated data.

Additionally, over the course of the past 20 years, the Sinkat Community Development and Derudeb and Haya Integrated Rural Food Security Projects have yielded a number of best practices. The study provides an overview of the some of the key issues that have resonated throughout the duration of both projects:

- The need **to ensure multi-year funding and commitment from donors** for programming. Intermittent fluctuations in funding can result in inefficiencies and reduced impact of interventions. Fluctuations in funding have been absorbed and desired impacts achieved primarily due to the extended timescale for both the Sinkat Community Development and Derudeb and Haya Integrated Rural Food Security Projects.
- The importance of **community ownership and relationship development. SRCS** staff and volunteers are trusted by the communities in which interventions were implemented. Priority was also placed on allowing various projects to be fully embedded within the community, to ensure involvement in decision-making, maintenance and care for project outputs in order to allow for community ownership.
- **Need to build effective and sustainable partnerships with governments.** In the absence of effective partnerships and assumption of responsibilities by governmental authorities, often times the SRCS has acted as a safety-net for the most vulnerable in the Red Sea State. This is important to recognize as the removal of the safety-net (i.e., SRCS activities) could render the population more vulnerable.

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