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A Study of the Viability of Zambia Co-Operative Federation (ZCF) Installed Solar Milling Plants in Zambia

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ABSTRACT
This portfolio thesis is aimed at critically evaluating the viabilities of the Solar milling plants and thought process of cooperatives in rural areas on repaying back of loans using pragmatic action research. This thesis contributes to the empirically and theoretically based understanding of, the impact of the presidential funds in Zambia. A case study of Solar Milling plants across Zambia via ZCF. This study was a participatory in nature, hence, a cross sectional approach was undertaken in the first half of 2016, 2017 and part of 2018 to access primary, district and provincial corporative responses regarding viability of the solar milling plants in the community and to ZCF. In the results, several findings were established which tried to satisfy the objectives of the study. The correlation model revealed that there was a significant difference in between monthly target and monthly recovery fund. A weak relationship was found between the two variables that indicate differences exist between the two groups. This implies that a The viability of solar milling plant and loan recovery is low and not very feasible. This result was found to be significant with p values less than 0.05 and the entire model was significant at p-values (0.0387<0.05). Regarding the factors related to Zambia Co-operative Federation (ZCF) Debt recovery on the installed solar milling plants in Zambia were revealed to repayment history, capacity of machine, Binding cooperative contract, raw material and system of recovery, OR=0.8494, p=0.001. It was also found that despite minor difference these factors were established to directly related to debt rectory. Recommendations have been made to ZCF management to also provide resources for the cooperatives who are managing the milling plants with startup capital to buy maize and packaging materials for the mealie meal and also provide tools for recovery officers to use when following up loan payments from cooperatives. The need to train cooperators on corporate governance, book keeping so that there is comprehensive general accountability.

Keywords: *zcf, viability, co-operative, solar milling plant*

I. INTRODUCTION

Today, countries' economies are faced with many challenges arising from the global economic slowdown, political uncertainties, population pressure, expanded wage bill, corruption and many more (World Bank, 2015). Due to the realization of such challenges facing our economies by governments across the world, parliamentary involvement in grassroot projects and community development have been growing in a diverse set of countries. As governments recognize these challenges in the global economy, parliamentary involvement in high-level programs and the development of people in different countries increases. As expected, the Zambian government came up with different projects in 2015, including a solar project promoted by the Office of the President and the Zambia Cooperative Federation (ZCF), who knew there was a way to transform rural people. And bring about the good. Viewing work development through a combination of collaboration and knowledge within a collaborative team, the identified needs require the efforts of the team and other partners to provide knowledge and additional support methods, including appropriate production materials. Today, Zambian political and economic observers are most concerned about the performance of solar power plants. Apart from this, the main objective of the solar factory is to reduce the cost of maize meal and promote employment for the people of Zambia, especially in rural areas of the country. The solar milling plant project is part of the Presidential Milling Initiative launched in 2015. According to the Zambia Co-operative Federation (ZCF), the total cost of the scheme as it is implemented is US$200 million. Mainly supported by loans from China Development Bank. The decrease is due to a decrease of $170 million instead of the previously estimated $200 million, as well as the addition of two training centers for the industry. A. Total cost of equipment installed = $70,000 Co-operatives interested in solar windmills must pay a non-refundable fee of K500 and provide proof of where the windmill and its equipment will be installed. Each beneficiary group must sign a contract with ZCF as an operator and repay the loan K1,700 in fifteen monthly

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installments from the date the factory is handed over to the company. The nature of refunds varies from place to place, and the fact that the organization is a legally mandated collection agency for bad funds raises many questions. and the efficiency of solar plants. Projects, profits and losses, and revenue from bread sales are long-standing and important issues for cooperatives and government agencies.

II. LITERATURE REVIEW

2.1 Overview of ZCF SOLAR Milling Project

Zambia's solar milling project is an important initiative, as high-quality flour is not available in most rural areas of Zambia. The demand for high-quality corn flour, our staple food, is driven by the growing rural population that has grown in recent years. With the country's economy achieving some positive growth, more rural people are able to afford high-quality flour, leading to an increase in demand. The Patriotic Front government took up this initiative because the idea was aimed at alleviating challenges in rural communities and also addressing rising pastry prices and supply chain dynamics. It was believed that these facilities would ensure a steady supply of maize flour from the cooperatives and communities at large in the district to the local market, potentially leading to lower prices and access to cheaper flour. It was therefore planned with the hope that by using solar energy for milling or grinding, the cooperative could save on fuel costs and electricity, potentially leading to improved economics of the milling operation. Although cooperatives are affiliated with the Zambia Cooperative Association, they are essentially autonomous self-help organizations managed and managed by rank-and-file members. The association only assists in the training and representation of the interests of its affiliated members. When cooperatives enter into agreements with other organizations, including governments, or raise capital from outside, they do so on terms that are favorable to themselves and their members. This is proof that we have concluded a solar power system rental contract with the Zambia Cooperative Society and that we have repayment obligations as stated in the contract. Solar power plant projects can have a positive impact on rural communities by creating jobs for local people and improving food security through things like pastries. As part of its work, the General Cooperation Committee will handle the company's monitoring and evaluation process and, if agreed, jointly establish a mechanism to monitor business operations. These must be done for the benefit of the local community, food security and general well-being of the community. For the long-term success of the cooperative, solar power plant projects can always choose to focus on sustainability. This means we need to focus on providing resources that help cooperatives continue to operate effectively in their communities once they are established. To operate a solar mill system effectively, operators must be trained and trained in safety, corn preparation, and other matters that will help run a cooperative store. The factory facility was planned with the aim of promoting economic activity for local residents and creating one or two jobs for the local community. Corn bran, a byproduct of flour milling, is sold to poultry farmers and large-scale farmers. The solar power system installed is essentially a presidential initiative initiated under Zambia's former president Edgar Chagwa Lungu. The solar power generation equipment was to be procured from China through a loan from the China Development Bank, and a total of 2,000 machines were to be installed in all 10 provinces of Zambia. Solar Milling Machine The solar power milling machine is a complete system developed by Beijing Bum International Engineering for Zambia and is the first of its kind. Providing affordable solar power systems that enable suitable grain/food processing techniques for the benefit of smallholder farmers in rural areas of Zambia. Factory equipment is located in rural areas with no electricity grid (A El-Salam, 2019). This solar flour mill will ensure the availability of edible maize flour obtained from maize and other dry grains such as cassava in Luapula province and rice in the western region of Zambia. Records show that this solar power plant project is new and Zambia was one of the first countries to install solar power plants. The solar milling program aims to support economic activity in local communities through product processing and is expected to create approximately 3,000 jobs for local residents. Three different types of solar milling machines will be delivered to the Zambia Co-operative Federation (ZCF). The first generation aircraft was delivered to Zambia for the first time. This machine has three compartments to store either grain, sand, or corn bran. During contract milling, operators always process flour according to the following steps: 2. 40/125 x 100 = 32 kg of corn flour and what is left is corn bran. 2nd generation solar milling machine (BMLM-2-00) manufactured by Beijing Bumu International Engineering Company in China. The second solar machine has additional features. This solar machine allows him to process 125 kg of corn flour per hour and consumes 8 kW. Second-generation solar milling machines are an evolution of the first machines, using air and pneumatic systems to transport or move materials. There is also a third generation solar milling machine (BMLM-3-00). Another additional feature of the 3rd generation solar machine is that it has two distributors that help separate the particles.

2.2 Overview of ZCF

Zambia cooperative federation is the apex body of all cooperatives in Zambia. It was established under the cooperative Act of 1998 and operate independently with the mandate to facilitate and provided and provide support to different cooperative societies in the country. Being the cooperative organization presenting the entire cooperative movement in Zambia, the Zambia Cooperative Federation (ZCF) coordinates cooperative activities and acts as a 'mouth piece' for the cooperative movement. In its latter capacity, ZCF serves as a lobbying institution for its members, especially when members need

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assistance from donors and/or when there are complaints regarding policy matters. ZCF also acts as a source of information for its members. ZCF also assists its members in the procurement of cheaper inputs; enables them access to markets for their produce; and facilitates members' access to various forms of infrastructure, such as storage sheds. Secondly, it is possible they can maintain a high level of service quality by providing good products that meet customer expectations with good results and low losses. The largest employers in this regard are government and semi-government institutions, and the second largest employer is Zambia Copper Consolidated Mining (ZCCM). These performance levels mean that the contribution of the cooperation program is second only to ZCCM in terms of contribution to gross domestic product (GDP). The purpose of establishing this working group is to assist members of the farming community in organizing the marketing of their products to copper mines in the Copperbelt and Katanga provinces. According to the information, the establishment of the first group will be a business linchpin for private sector projects to benefit from the large mining market. In order to organize and operate cooperative businesses, the government of the time enacted the "Cooperative Societies Act." (AN ACT) and established the Department of Trade and Industry (DMC) to regulate cooperatives. Legal DMC is responsible for the registration and management of cooperatives. At independence in 1964, there were still 200 cooperatives, and the new government launched a vigorous campaign to promote cooperative establishment as a means of promoting socio-economic development, especially in rural areas.

2.3 Business Viability and Performance of Co-operatives in Zambia and Role of ZCF

Value-based profitability: A business can be profitable when all stakeholders can get good results and good results that make daily activities worthwhile (Chesbrough et al., 2006). Because of this, it shows the organization's assumptions about customer needs, how they want it, and how the company can meet those needs and generate revenue. The diagram above shows how to manage a business with all product processes, a system that will help you determine the viability of your business. Furthermore, when all the systems described above are completed, the cooperative project is expected to run smoothly and produce good results. Second, it can be done if you can maintain a high level of service quality by providing good products that meet customer expectations with good results and low losses. The largest employers in this regard are government and semi-government institutions, with the second largest employer being Zambia Copper Consolidated Mining (ZCCM). These performance levels mean that the cooperative program's contribution is second only to ZCCM in terms of its contribution to the country's gross domestic product (GDP). The purpose of the creation of this working group is to help members of the farming community organize the marketing of their products to the copper mines in the Copperbelt and Katanga provinces. There are many business opportunities for food supply in the mining industry, and knowing that approaching the mines individually to strengthen their marketing power will affect the marketing power, they chose to trade. Mines in mixed companies. According to the information, the creation of the first groups represents a business pivot for private sector projects to benefit from the large market that exists in mining. To organize and manage cooperative enterprises, the then government introduced the "Cooperatives Act" (AN ACT) and established the Department of Trade and Industry (DMC) to regulate the Cooperative. Law The DMC is responsible for registering and managing cooperatives. This continued after independence, and in 1970 an Act of Parliament was passed to regulate all matters relating to cooperative development. In this new law, the oversight role of the government and the ZCF was carefully designed so that a former government appointee on each board could exercise control over the government's involvement in project policy at each level of cooperation. movement in Zambia. At independence in 1964, 200 cooperatives still existed, and the new government began a vigorous campaign to promote the creation of cooperatives as a means of promoting social and economic development, especially in rural areas.

2.4 Review of Similar Studies

A study conducted in India (Amira, 2017). reviewed that use of solar energy is the alternative to grid line were operating some small, fixed machines such as solar powered grinding machine. Indía has invested heavily in such inversion to always improve rural supply of quality mealie meal. This is one way the country is seen to deliver development to its people. On the other hand, from an African perspective, Zimbabwe signed a memorandum of understanding (MOU) with Minister Sithembiso Nyoni to establish solar power plants under the development of small and medium-sized enterprises. The economic growth of the rural population is key to the development of business and commerce through SMEs (Ndione, 2020) and the achievement of financial independence of work groups through SMEs. Many countries are working on building solar power plants to provide people with affordable and decent jobs. The program has been successful in countries that provided early assistance to rural areas with limited electricity and basic sanitation services. In Zimbabwe, economic policy analysis and research led to a solar milling system to improve food security and reduce milling costs. The aim of the program is to support small farmers by providing access to factories. For example, Helicon (2023) reports that they assessed the potential of the Hwange and Lupane sites in Zimbabwe to host large-scale concentrated solar power (CSP) facilities. It turns out that Lupane is the best place to build a CSP office to help policymakers set renewable energy prices, thereby driving economic growth and development. Munyenyebe (2015) conducted a study to assess the impact of solar power generation on the economy of the people in Kete District, Zambia. The objectives are to assess the performance of solar mills, the impact of solar mills on wheat

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flour prices in local markets, the impact of solar mills on activities in the state, and explore the challenges faced by employees and managers. The role of solar systems in the state's economic development and outlines the measures that must be implemented to make the project sustainable. Their findings contradict this idea, as people in Kate's community do not benefit financially from solar energy. According to the findings, solar energy utilization in the state is low and underutilized. The power plant has not affected corn prices in the state. Von Ravensburg (2011) conducted an analytical study on building business relationships and their economic, social and organizational benefits. This research was supported by COOPAFRICA, a program promoting good policy and law, sustainable management, governance and governance. Technical assistance from the ILO Tanzania Office and ILO partner organizations. Although this study is not directly related to the actual business practices of trade unions, it provides necessary ideas for its design evaluation. This is the case in Zambia, where cooperative business models exist in the agricultural sector, particularly among small companies engaged in the production, processing, marketing or supply of raw materials. The author believes that this is due to a lack of cooperative principles or a lack of knowledge, although economic cooperation is very important in the economy. This development will encourage the promotion of business partnerships between MSMEs and informal enterprises (First President's Address to the National Assembly, 2016). Mbuzi i (2005) conducted a study whose overall objective was small scale maize processing operations in Lusaka district. The objectives are to understand management and control systems, identify different business strategies and analyze the strengths, weaknesses, opportunities and threats associated with a small plant (SWOT analysis). A structured questionnaire was used to collect information from smallholder maize millers. The findings indicate that there is a lack of knowledge among both workers and owners in small-scale corn processing enterprises. They found that most hammer mills were owned by men, and most had no employees with marketing, accounting or operations training. The study also found that most small corn mills were easy to manage because the owners were just relatives of the child laborers. Competition from large steel mills and new entrants in the industry is the major threat and the weakness found is that most of them are not well trained and have received basic training. From the above information, it can be seen that the workload of small-scale maize milling factories is huge as women need to be encouraged to start maize milling business with little training of workers. . Other administrative, maintenance, accounting and marketing areas. The government should provide appropriate guidance to small-scale maize processors to meet their needs. Lolojih (2009) conducted a study to evaluate the performance of cooperatives in Zambia. The results of this study indicate that cooperatives are weaker in terms of both revenue and performance. Unions are not transparent and cannot directly represent their members. The National Employment Development Policy emphasizes the responsibilities of the Ministry of Employment at the federal and local levels. Although the weakness of the alliance is evident due to lack of funds to support its members to study in cooperative colleges, there are still many groups formed with the sole purpose of making profits from government fertilizer support.

Program (FSP). Research also shows that collaboration teams do not make good use of support provider capabilities, primarily due to a lack of good partners at the application level. For example, a partnership is not required to attract or take advantage of foreign investment opportunities, such as Rabobank's acquisition of 49% of the National Commercial Bank of Zambia. Overall, this study found that the cooperative movement's contribution to the country's social development is not significant. There are no statutory or non-statutory requirements for public safety and/or services that a partnership may provide. As a result, members are less interested in what the union is doing – meaning the union's voice is not being heard. However, this article suggests that cooperative organizations in Zambia can become a sustainable tool for the development of the country if the government adopts policies that support, rather than manage, cooperatives. Chinese investments in Africa and Zambia, in particular, have opportunities to boost access to income, another study said, adding that the Southern African Development Community roadmap identifies food security as one of its One of the biggest growth areas. Chance. Member states should strengthen cooperation to enhance local production of agricultural machinery, equipment and parts and benefit from relationships between the agricultural sector, manufacturing and economic sectors. Another researcher also discussed cooperation between China and Zambia in infrastructure development, encouraging people to work, and education and training in the use of solar power plants. However, several studies explain how knowledge management and skills in formulating strategies, management methods, working methods, knowledge sharing and learning, and capturing and storing knowledge can be used for economic and social development in this context. Available in Zambia. This UNCTAD notice clarifies that most of ZDA's financing activities must be conducted among groups where investors are not fully aware of the opportunities available. Some studies have pointed out that agriculture and tourism may be the most important ways for China's direct investment in Africa to increase remittances. Furthermore, the Ministry believes that cooperatives can benefit from business management training, the results of which can be seen in communities as self-help groups fighting poverty.

III. THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1 Theoretical Framework

It is the 'blueprint' of a research (Grant & Osanloo, 2014). It is a framework based on an existing theory in a field of inquiry that is related and/or reflects the hypothesis of a study. It is a blueprint that is often 'borrowed' by the researcher to

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build his/her own house or research inquiry. It serves as the foundation upon which a research is constructed. The theories that have being covered in this research include; the stakeholder theory, the bloom's taxonomy of learning theory, resources-based theory, balanced theory and Viability theory. Several theories have been developed in this area of study. After discussing these theories, a theoretical framework was provided.

Viability Theory

Viability theory is an area of mathematics that studies the evolution of dynamical systems under constraints on the system state. It was developed to formalize problems arising in the study of various (Aubin, 2004).The concept of viability arose with Stafford Beer in the 1950s through his paradigm of management systems.The main purpose of viability theory is to explain the evolution of the state of a control system, governed by nondeterministic dynamics and subjected to viability constraints, to reveal the concealed feedbacks which allow the system to be regulated and provide selection mechanisms for implementing them(Saint-pierre, 2011; Schwaninger, 2018, 2018). It assumes implicitly an "opportunistic" and "conservative" behaviour of the system: a behaviour which enables the system to keep viable solutions as long as its potential for exploration (or its lack of determinism). This this study the researcher looked the viability of the solar milling plant project in terms of cost of operations, impact to the society and federation, the general feasibility of the project in Zambia, time =frame and sustainability of the project whilst looking at the ability of the ZCF to pay back the loan. As such the theory of viability helped pprovide new insights into or ways of understanding the viability of solar milling plants and iimproved the effectiveness of the analysis by clearly articulating the methods and made the results more easily understood by the audience as well as by the scholars themselves (Munyenyembe, 2015; Id, Quattrociocchi and Fedele, 2018; Schwaninger, 2018).

The Expected Utility Theory

Neumann Von, John and Morgenstern Oskar (1944) suggested the expected utility theory which is supported with logical explanations related in social and human psychology. The expected utility theory clams that individuals have limited information processing capabilities that exhibit systematic bias in processing information. They therefore hold that behaviors like default on debt repayment is motivated by risk aversion with an expected utility of unwarranted gains through earnings from the unpaid debts. However, this theory is not plausible since it fails to provide a reason behind the default decisions made under uncertainty like business failures, loss of employment and accidents (Briley, and Myers, 2005). It was recommended that collecting reliable information from potential borrowers becomes significant in achieving effective screening in debt recovery techniques that are used to enhance performance of financial institutions as suggested by the expected utility theory. Although the trend seems to be recording a reduction over the years, the number of debts is still high and requires further analysis so as to increase the performance of financial institutions (Ontana, 2012). It is argued that in the existence of a risky outcome, then the lender makes use of the expected value criterion to ensure their debt recovery. Some people would be averse to risk enough preferring the sure thing, although it has a less expected value, while the less risk adverse customer would choose the risk and higher mean lender.

Bloom's Taxonomy of Learning Theory

The taxonomic learning theory proposed by Bloom in 1956 attempted to identify various cognitive skills (Chimwani, Iravo & Tirimba, 2014). This theory divides thinking into six levels of cognitive complexity; information, understanding, inquiry, questioning, synthesis, and evaluation, from Level 1 to Level 6, represent increasing levels of difficulty in cognitive skills (Wilson, 2013). Compared to the hard parts, the three sub-parts are easier and therefore demand higher capacities (Chimwani, Iravo & Tirimba, 2014). The relevance of this theory to this study is that the survival of the solar mills installed by the Zambia Federation of Cooperatives is highly dependent on the qualifications and skills of the workers. The success of any commercial project requires a good feasibility study, and this is also true for today's co-op projects. Therefore, it is very important to conduct a feasibility study to ensure that the project can use accurate and reliable information to ensure the success of the project. The feasibility study of the solar energy project looks at the evaluation of the technical aspects of the factory that will produce the flour that is suitable for the society and also the management evaluation which means the business activities and the preparation of timely delivery of assets, sustainable manufacturing processes, evaluating business and market performance. The time and economic power of being able to consume the wheat flour produced and the ability of the community to bear the costs of the wheat flour. With the support of a feasibility study, project team members will be more focused.

3.2 Conceptual Framework

A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and to communicate this. It is used in research to outline possible courses of action or to present a preferred approach to an idea or thought.. According to Bogdan and Biklen (2003) a conceptual Framework is a basic structure that consists of certain abstract blocks which represent the observational, the experiential and the analytical/synthetically aspects of a process or system being conceived. The interconnection of these blocks completes the framework for certain expected outcomes.

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The analysis of the independent variable and its influence on the dependent variables makes it possible to find answers to the research problem represented in form of a model known as a conceptual framework (Sekaran, 2009). In this study, the independent variables are: Capacity of machines, , material availability which form the feasibility aspect, mealie-meal output, Market demand, impact and cost of operations, Debt recovery are therefore, independent variables affecting the dependent variable which is the viability of solar milling plant projects.

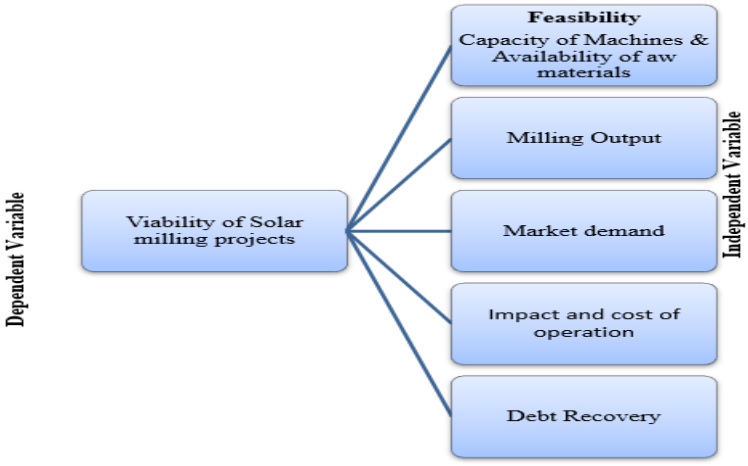

Figure 3.5: Conceptual Model
Source: Author (2020)

Research Hypothesis
This study therefore, sought to approve or disapprove the following two hypothesis below:
Null Hypothesis (H_0): The solar milling plant project is viable and sustainable project.
Alternative Hypothesis (H_1): The solar milling plant project is not viable and sustainable project.

IV. RESEARCH METHODOLOGY

Research Design

The research design used in this study was descriptive where both qualitative and quantitative methods are used. This design is the most appropriate because the study involves an in-depth analysis of loan collection over a period of three years, quantifying the results in order to fulfill the stated research objectives. Yin.R.K.(1989) brings out a case study that analyses specific group of stakeholders and constructs a stakeholder salience assessment framework and uses it in analyzing product development process phenomenon within its real- life context. Quantitative approach was used to assess the viability of the solar milling plants business, collect data on demographic profile and characteristics of cooperatives. The reason for using qualitative approach was to enable the researcher to understand the context in which certain events occurred in order to interpret the findings accurately studied. Therefore, this research was influenced by the systematic, scientific of positivist and post positivist approaches to research. As advanced by Cooper and Schnidler (2008), a quantitative method allows for the generalization of the findings among cooperatives and provides a framework for carrying out extensive research. A qualitative approach was used to collect data on reasons for delay in the remittance of loans repayments to Zambia cooperative federations, challenges the cooperatives facing in their day-to- day business operations with objective of securing the repayment amount for the federation and challenges the federation face in following up these loans from cooperatives.

Research Population

The research was conducted in three provinces targeting communities around the Solar milling project and committee members of the cooperative movement. A total of 250 questionnaires were given out using availability and purposive sampling. Gschu (2004) underscores the importance of selecting a representative sample through making a sampling frame. A good group such as the availability could be practical as they will provide ideal situation, they deal with on a daily basis from managing the business of the milling plant (Sedgwick, 2013; Etikan et al, 2016) Gives the researcher the confidence when analyzing sales trends of the cooperative business for a certain period to understand cashflow process and production lines.

Data Collection and Quality control

The research used both primary and secondary data. The main data for this study were obtained through a questionnaire, which was divided into three main parts. The selected areas are the central business districts of each area selected for the study. Secondary data was collected by analyzing a database of business records for every agreement in the

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country from June 2018 to May 2020, and in-depth interviews were also conducted with communities around the factory, solar energy, consumers and government employees to better understand learn. Activity. People in the community. Therefore, out of 280 members, there are 100 corporate members, 90 community clients, 20 administrative staff and 70 partnership committee members. The data collected facilitates knowledge testing.

Data Processing and Analysis

In the data processing and analysis, respondents were ranked according to location in the province and availability of raw materials. The study used quantitative and qualitative research procedures in data analysis. The two methodological procedures were used in order to counter shortcomings from each technique (Saunders et al, 2003). The nature of the study also necessitated the use of both approaches to answer the research questions. Questionnaires for primary data was processed and analysed using SPSS and Microsoft Excel. The advantage of these methods was that they are easy to use and easy to understand. Thereafter the data was analysed and presented statistically using simple statistical approaches such as frequency tables, pie charts, bar charts and making inferences

Ethical Consideration

Ethical issues were considered when conducting this study. Before the collection of data permission was sought for the case study from Management of ZCF. Prior to that permission was also sought from the Executive of the Provincial Co-operative union before administering of questionnaires. For purposes of confidentiality, respondents' names were omitted in the presentation and analysis of data.

V. DATA PRESENTATION AND ANALYSIS

Introduction

In order to demonstrate on the results and its findings, this section demonstrates the answers based on the research questions (David, 2000). David advises researchers using case study methods to use themes. Data presentation and Analysis has been presented according the objectives, as such the following are the themes standing;

- The viability of the Solar milling plants
- The debt burden to ZCF from Solar milling cooperatives
- The ability by ZCF management to collect loans

Characteristics of Cooperative membership

In this study, we drew 280 respondents. There were a total of 160 males selected representing 57.1%) males and female has a total of 120 representing 42.9%. Gender of respondents as demonstrated from table 5 below shows that 57.19% of co-operatives members associated with solar milling plants in the three provinces were men and 42.9% are women. At this point it not feasible to talk about gender equality participation in running of solar mills, as they are many.

As indicated on the table below, it highlights on percentage a representation of each of the provincial cooperative union given and the three (Cooperative leadership, general worker and community membership) categories picked for this study gave a wide array of representation of the different social classes in society. Table 5 shows a summary of the membership variables of the respondents.

Table 1: Summary of demographic variables

Cooperative Membership variable	Frequency	
Sex	**N**	**%**
Male	160	57.1
Female	120	42.9
Occupation		
Private Sector Employees	60	21.4
Informal Sector	130	46.4
Civil Servant	90	32.1

Table 2: Viability of the Solar Milling Plants

Table 2 shows province by province collections and percentage balance annually. The total deficit for Northern account for 70.3% annually while Muchinga and Eastern account for 74.5% and 60.6% respectively. From the information

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above, it is clear that at this rate it is not possible to recover cooperative loans from set committees under this model and there is no sign of potential improvement in revenue collection from the three provinces under this study.

Table 2: Viability of the Solar milling plants by provincial Collection Status 2018

2018				
Province	**Total Annual Forecast**	**Actual Collection**	**Actual Bal**	**Annual Deficit(%)**
Northern 120 Plants	2,448,000	527,000	1,921,000	78.5
Muchinga 123 Plants	2,509,200	480,000	2,029,200	80.9
Eastern 115 Plants	2,346,000	705,000	1,641,000	70.0
	7,303,200	1,712,000	5,591,200	76.5

Source: Extract from Provincial coordinator's reports

Table 3: Viability of the Solar Milling Plants by Provincial Collection Status 2019 and 2020

Table.3 shows 2020 province by province collections and percentage balances annually to the Federations. The total deficit for Northern account for 83.7% annually while Muchinga and Eastern account for 83.5% and 84.3% respectively. From the information above, it is clear that loan recoveries on the third year basis have failed to pick up. Re-planning will be ideal if growth was to be recorded.

Province	**2019**				**2020**			
Province	**Total Annual Forecast**	**Actual Collection**	**Actual Bal**	**Annual Deficit(%)**	**Total Annual Forecast**	**Actual Collection**	**Actual Bal**	**Annual Deficit(%)**
Northern 120 Plants	2,448,000	350,000	2,098,000	83.3	2,448,000	399,000	2,049,000	83.7
Muchinga 123 Plants	2,509,200	655,000	1,854,200	64.7	2,509,200	415,000	2,094,200	83.5
Eastern 115 Plants	2,346,000	425,000	1,921,000	77.9	2,346,000	369,000	1,977,000	84.3
	7,303,200	1,430,000	5,873,200	74.6	7,303,200	1,183,000	6,120,200	83.8

Source: Extract from Provincial coordinator's reports

Now how can the federation improve on its collections of loans from the three provinces where the research is done? This being pragmatic action-oriented research, this part of the research was answered using an open gathering organized by the federation. as explained in the methodology and the research design matrix in chapter four. The Research questions that were asked answered and elaborated in details below.

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Table 4: With the current system design of solar milling plants, do you think it is possible for this project to achieve intended results?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	5	41.5	41.5	41.5
Disagree	2	16.6	16.6	58.1
Not sure	1	8.3	8.3	66.4
Strongly agree	2	16.6	16.6	83
Agree	2	16.6	16.6	99.6
Total	12	99.6	99.6	

The table above illustrate that 41.7% of loan recovery officers strongly disagree that the current system design of solar milling plant is able to achieve intended results and 16.6% disagree. 8.3% of Recovery officers are not sure looking at the design of the solar milling plant and its intended results. However, another 16.6% agree and 16.6% strongly agree. However, from the table above, in totality 58.3% of the recovery officers on the ground feel that the current system design of solar milling plant cannot achieve intended result. 33.2% of them feel it is possible and agrees that current system design can help achieve results. Therefore, based on these findings, it implies that the system design in its current form cannot achieve intended result.

Table 5: Summary of Viability Output

Regression Statistics	
Multiple R	0.15585
R Square	0.41148
Adjusted R Square	0.13012
Standard Error	667553.7
Observations	9

ANOVA

	do	*SS*	*MS*	*F*	*Significance F*
Regression	1	35167431327	3.52E+10	0.048917	0.0386893
Residual	7	3.1194E+12	4.46E+11		
Total	8	3.15456E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.399522.5	313239.1053	1.275455	0.242842	-341170	1140215	-341170	1140215
Monthly recovery	2.450788	8.724120425	0.280921	0.0386893	-18.1785	23.08005	-18.1785	23.08005

Intercept: Monthly Target

The correlation model indicates there was a significant difference in between monthly target and monthly recovery fund. A weak relationship was found between the two variables that indicate differences exist between the two groups. This implies that the viability of solar milling plant and loan recovery is low and not very feasible. The result was found to be significant with p values less than 0.05 and the entire model was significant at p-values (0.0387<0.05).

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5.3 Debt Burden to ZCF from Solar Milling Cooperatives

Table 6: Cooperative inability to pay the loans, could it be that the amount is too much considering the production capacity?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	6	49.8	49.8	49.8
Disagree	2	16.6	16.6	66.4
Not sure	0	0	0	66.4
Strongly agree	1	8.3	8.3	74.7
Agree	3	24.9	24.9	99.6
Total	12	99.6	99.6	

Source: Primary Data

The above table indicates that 49.8% of the respondents strongly disagree and 16.6% disagree that Cooperative inability to pay the loans, could it be that the amount is too much considering the production capacity. This makes a total of 66.7% that have disagreed in accumulation. that value. On the other hand, 25% agree and 8.3% strongly agrees. In total, those who agree that the accumulated to 33.3%. The findings of the table suggest that Cooperative inability to pay the loans to some extent is also attributed to amount expected to be paid out monthly is too high for the revenue coming through monthly.

Table 7: With the current production runs from milling plants, is there hope with continuing running the project?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	4	33.2	33.2	33.2
Disagree	2	16.6	16.6	49.8
Not sure	1	8.3	8.3	58.1
Strongly agree	2	16.6	16.6	74.7
Agree	3	24.9	24.9	99.6
Total	12	99.6	99.6	

The above table indicates that 33.2% strongly disagree and 16.6% disagree that the current production runs of the milling plants can be viable. The total of those who agree stand at 16.6% and the total of those who strongly disagree is 24.9%. This implies that the outstanding debt is not collectable by the Loan Recoveries Officers themselves.

Table 8: Implication of loan repayment delays on ZCF/China loan agreement on solar milling plants?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	0	0	0	0
Disagree	0	0	0	0
Not sure	11	91.3	91.3	91.3
Strongly agree	1	8.3	8.3	99.6
Agree	0	0	0	99.6
Total	12	99.6	99.6	

As shown above from the data collected a total of 91.3% of the interviewed loan recovery officers are not sure of any implication of loan repayment delays on ZCF/China loan agreement on solar milling plants, what they believe these are government project 8.3% of the respondents strongly agree. There was no one indicating to disagree or strongly so implying that cooperative members do not buy the idea of ZCF/China loans. Government funded the project for rural development.

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Table 9: Responses to whether delayed repayments could be attributed to poor mobility tools provided by collecting agency/ZCF

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	3	24.9	24.9	24.9
Disagree	2	16.6	16.6	41.5
Not sure	1	8.3	8.3	49.8
Strongly agree	3	24.9	24.9	74.7
Agree	3	24.9	24.9	99.6
Total	12		99.6	

Source: Primary data

The table above indicate that 49.8% agree and strongly agree that delayed repayments could be attributed to poor mobility tools by collecting agency/ZCF. In particular, 41.5% of the respondents strongly disagree that delayed repayments could be attributed to poor mobility tools by collecting agency/ZCF. Overall, the findings of question 15 suggest that delayed repayments could be attributed to poor mobility by collecting agency/ZCF.

Table 10: Responses as to whether amending payment terms can improve the effectiveness of loan collection

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	1	8.3	8.3	8.3
Disagree	2	16.6	16.6	24.9
Not sure	1	8.3	8.3	33.2
Strongly agree	6	49.8	49.8	83
Agree	2	16.6	16.6	99.6
Total	12		99.6	

Source: Primary data

Table 10 shows that 24.9% of the respondents disagree that amending payment terms can improve the effectiveness of loan collection and 49.8% strongly agree that amending payment terms can improve the effectiveness of loan collection. 16.6% also agreed. 8.3% were not sure amending payment terms can improve the effectiveness of loan collection. This suggests that amending payment terms can partially improve the effectiveness of loan collection.

5.4 Viability and Ability by ZCF Management to Collect Loans

Table 11: Responses as to whether making use of technology like mobile money can help improve loan collections

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	1	8.3	8.3	8.3
Disagree	0	0	0	0
Not sure	1	8.3	8.3	16.6
Strongly agree	9	74.7	74.7	91.3
Agree	1	8.3	8.3	99.6
Total	12		99.6	

Table 11 above shows that 8.3% of the respondents strongly disagree that making use of technology can help improve loan collections and another 8.3% are not sure that making use of technology can help improve loan collections. 74.7% strongly agreed that making use of technology can help improve loan collections and another 8.3% merely agreed. This implies that making use of technology can help improve loan collections.

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Table 12: Responses on use of the external debt collectors or collection agency can improve debt collection

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	7	58.1	58.1	58.1
Disagree	2	16.6	16.6	74.7
Not sure	1	8.3	8.3	83
Strongly agree	1	8.3	8.3	91.3
Agree	1	8.3	8.3	99.6
Total	12		99.6	

Table 12 above indicate that 58.1% strongly disagree that and 16.6% disagree that use of the external debt collectors or collection agency can improve debt collection. On the other hand, 8.3% of the respondent are not sure. Further 8.3% strongly agreed and 8.3% agreed. In principle the record showed that use of the external debt collectors or collection agency cannot improve debt collection.

Table 13: Responses as to whether early contact with the clients can improve debt collection effectiveness

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	8	66.4	66.4	66.4
Disagree	2	16.6	16.6	83
Not sure	0	0	0	0
Strongly agree	1	8.3	8.3	91.3
Agree	1	8.3	8.3	99.6
Total	12		99.6	

Table 13 indicate that 66.4% of responded strongly disagreed and 16.6% disagreed that early contact with the clients can improve debt collection effectiveness. 8.3% strongly agree and another 8.3% merely agreed. This implies that early contact with clients still cannot improve loan collection effectiveness.

5.4.12 Other Factors Related to Viability and Debt Recovery

The factors related to Zambia Co-operative Federation (ZCF) Viability and Debt recovery on the installed solar milling plants in Zambia were revealed to repayment history, capacity of machine, Binding cooperative contract, raw material and system of recovery, OR=0.8494, p=0.001. It was also found that despite minor difference these factors were established to directly related to debt rectory. Binding cooperative contract, raw material and system of were found to be statistically significant ($p < 0.001$).

Coefficients

Table 14 Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**95.0% Confidence Interval for B**	
	B	Std. Error	Beta			**Lower Bound**	Upper Bound
(Constant)	1.223	.323		3.784	**.001**	.588	1.857
Repayment history	.057	.078	.031	.733	.464	-.096	.210
Machine capacity	.211	.158	.055	1.340	**.018**	-.098	.520
B.C. Contract and system recovery	.032	.021	.013	.624	0.57	.067	.187
Raw materials	-.373	.079	-.209	-4.737	**.001**	-.528	-.219

a. Dependent Variable: Debt recovery

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VI. DISCUSSION

The literature review revealed that ZCF as an association faces challenges in meeting loan repayment deadlines and in the study, it was revealed that the main issue was the profitability of the project to cover all monthly costs and maintain working capital. The question that comes in now is the issue of viability of the project to sustain all monthly cost and remaining with operating capital (Tadesse, 2011; Munyenyembe, 2015; Imasiku, 2021; Ssegawa and Muzinda, 2021). This has caused over 90% of the cooperatives struggling to pay loans. This means that the profitability and credit recovery of solar power plants are low and not very viable. Additionally, the investigation found that ZCF's debt collectors were unable to collect all current and old debts. The findings show that cooperatives do not even have the capital to purchase raw materials such as corn or packaging materials. They don't produce enough to sell, and they don't raise enough to buy all the corn they need to meet the community's monthly expectations for cornmeal. Who reported that while there is a market potential for stand-alone solar plants, they are not yet commercially viable or competitive with established diesel plants. Although the operating costs of solar power plants are much lower than diesel plants, the capital costs of the plant and power system remain a major barrier to market entry. The resulting narrow economic base makes it difficult for cooperatives to compete effectively in the labor market for qualified and experienced workers (Lolojih, n.d.; Kolcun and Zsolt, 2021). As a result, factories that rely on solar energy to generate electricity are unable to operate, and the cooperatives that rely on them for a living are saddled with debt. This debt is built from months of unpaid loans due, therefore there is need for ZCF to positively relook at the model for this project to succeed, ZCF also may need to consider acting as main guarantor for cooperatives who wish to borrow operating capital for the milling plants as long as they remain vigilant in monitoring their performance so that whatever is borrowed is put to good use and in return ZCF continue to receive loans on time. Another factor which has contributed to the poor loan collection is leadership at cooperative level. Therefore, cooperative management need to find ways of educating committee leadership giving chance to other members when their mandate expires. Similar authors have reported similar findings for instance UKAID (2020) study on solar milling: exploring market requirements to close the Commercial viability gap revealed that respondents encountered during field visits were not aware of the existence of solar mills in their locations. They were very receptive to using solar mills due to the operational benefits they identified. If solar power plants are to be introduced commercially, a campaign is needed to increase market awareness. This can be done by disseminating the message through demonstration sites at distributor offices and through the use of agricultural extension agents. The investigation revealed that the issue of K75's recommended pricing system, which is below market price in accordance with ZCF specifications from the establishment period of 17/18/2016, has also caused further problems for the cooperative. This directive made the mill project unprofitable and required the cooperative to produce and sell large quantities of cornmeal bags to meet the net value needed to cover all costs. Therefore, management needs to review the pricing system and allow cooperatives to set prices in comparison to the current situation. This result is consistent with the findings of other authors who claimed that solar flour mills have no impact on cornmeal prices in the area. Therefore, cooperatives and associations should consider connecting their solar power plants to the national grid to improve production. Minutes of the 2018 board meeting revealed that nonpayment of loans to ZCF affected both repayments to Chinese banks and its own operations. This creates financial challenges for facilities to meet all operational obligations associated with regular site visits, repair work, and most importantly, sourcing packaging materials for sale to deli cooperatives. It means continuing to face it. The cooperative movement generally has a weak income base and organizational structure. The ``collapse'' of the cooperative movement in Zambia can be attributed to the lack of a plan for political change on the government's part and the emergence of weak cooperative organizations whose internal organizations were not strong enough to withstand liberalization reforms. Similarly, in 2015, Munyembe argued that the "collapse" of the cooperative movement in Zambia was due to the lack of a political transition plan on the part of the government and the emergence of weak cooperative structures whose internal structures were not sufficiently strong. he claimed. To survive liberalization reforms. It is plausible to argue that the ``collapsing'' co-operative movement in Zambia is a reflection of weak internal institutions whose internal structures were not strong enough to withstand political reforms that had a weak impact on the revenue base. ZCF faces the challenge of readjusting its charter to accommodate other types of non-agricultural cooperatives in order to increase its visibility and membership. Additionally, this result indicates that ZCF does not have the urgently needed vehicle capacity to continuously visit all subcontractor factories and address complex issues affecting production processes and business operations. is shown. For this project to be successful, ZCF leaders need to lobby the government for working capital support, which should be maximized for project operations. This may include loan officers equipped with vehicles to help visit all districts and states where solar projects are built and operated. Research shows that loan officers are poorly equipped with vehicles and other tools to travel in rural areas and follow up on loans (Id, Quattrociocchi and Fedele, 2018; Imasiku, 2021; Duqm, 2022; Guno and Agaton, 2022; Singh *et al.*, 2022). This finding is consistent with the statistical analysis conducted to determine the factors associated with debt recovery of the Zambia Cooperative Federation (ZCF) for solar PV systems installed in Zambia. According to the results, the main factors were repayment history, machinery capacity and commitment cooperation agreement, raw materials and collection system, with OR=0.8494, p=0.001. In light of this, ZCF needs to go back to the basics of the project and reinvent itself from an apex

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organization to a cooperative (Tadesse, 2011; Ssegawa and Muzinda, 2021; Guno and Agaton, 2022; Maliro, Diarra and Samikannu, 2022).

VII. CONCLUSION AND RECOMMENDATIONS

From the study conducted, it is clear to see that the union is representative among the rural communities belonging to the cooperative movements. Its effectiveness, which is reflected in the number of solar mills built nationwide, is a sign that the association has good support among the farmers. However, the viability of the project with unlikely loans will carry the project through, and all the indications are that the solar project is not feasible in its current form, the project is inconsistent with the goals, the funds are not there to pay all the payments. . and make a profit. However, according to an expert, the existing planning literature is fragmented. To overcome this shortcoming, a new technology is needed that includes all the elements important for the success of milling equipment, such as modifying the design to obtain a clear connection. Wesco network establishing new business rules that include the improvement of good governance and continuous training and development. It is also necessary to adopt a scientific approach to the design, it is easy to understand and use the village elected personnel to use machines to ensure that the reduction of monthly defects are continuously recorded, which increases the operational costs of business management, strengthens the existing ones. At the end of the day, we can prove that what is produced can meet community demand on a daily, weekly and monthly basis as planned. Future project research should also focus on rigorous testing to assess and ensure it meets consumer expectations. This will help the cooperatives of solar power plants to develop. In addition, it will help the government to reduce the supply of flour meals in rural communities. Collection strategies were reviewed from all available literature reviews and then tested for effectiveness using questionnaires administered to collaborative members and then analyzed using SPSS. It was identified that the Zambian cooperative ignored some challenges when evaluating the establishment of the project. These include insufficient support from senior management to deal with important issues raised by loan officers when they go to collect loans, overcrowding, shortages. Regarding special training in debt collection, it was also found that failure to collect negatively affected the quality of service, made it difficult to meet customer expectations and provide assistance to deserving people. Various strategies were analyzed in terms of both business viability and debt collection effectiveness. These are early contact with customers, change payment terms, deal with customer complaints quickly, make statements and reminders, adjust the production technology of machines, offer different platforms to pay debts, develop good customer relations, understand customers and use external debt tools.

Recommendations

Past research have shown that there are so many ways the federation can enhance its loan recovery from its debtors. The few measures federation can put in place include the following;

- Research findings show that early contact with customers increases loan recovery rates and reduces the amount of debt security deposits.
- The Association must prepare a payment plan that is considered to be manageable by the national group, taking into account the level of business recorded each month and reducing the amount of debt.
- Debt collection officers should always be encouraged and trained to carry out their duties because professionalism is the hallmark of the organization and its procedures that increase the chances of recovering money.
- The Federation should also consider a mass SMS program as a new technology to reach out to all working groups across the country.
- Debt collection officers must demonstrate honesty and document the payment dates promised by the party, a practice that will yield results.

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