

**A STUDY OF THE VIABILITY OF ZAMBIA CO-OPERATIVE FEDERATION (ZCF)
INSTALLED SOLAR MILLING PLANTS IN ZAMBIA**

BY

GEORGE NKANDU

**A dissertation submitted to the University of Zambia in partial fulfillment for the award of
degree of Masters of Business Administration- Management Strategy.**

THE UNIVERSITY OF ZAMBIA

LUSAKA

2024

DECLARATION

I, **George Nkandu**, do hereby declare that this work is my original work achieved through personal reading and research. This work has never been submitted to the University of Zambia or any other Universities. All sources of data used and literature on related works previously done by others, used in the production of this Dissertation have been duly acknowledged. If any omission has been made, it is not by choice but by error.

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APPROVAL

This Dissertation by George Nkandu is approved as in partial fulfilment of the requirements for the award of the Degree of **Masters in Business administration- management strategy**.

Examiner 1

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Examiner 2

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Examiner 3

Signature

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Board of Examiners

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Supervisor

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ABSTRACT

Zambia co-operative federation has been occupied with the desire to supply affordable and quality mealie meal to the rural communities, sustain a viable projection through loan collection while maintaining “public trust”. The aim of this study is to critically evaluate 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 2018, 2019 and part of 2020 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 relate to debt rectory. All in all the study established that although, the trend has been going up, the PI trend is still below 1. This means each invested dollar is generating revenue of less than 1 dollar. Since the profitability index is less than 1, the project should be rejected. 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. There is need also to increase revenue collections for the federation through support system where co-operatives are assisted with resource base to buy raw materials needed for production, By doing that co-operatives will have products readily available for communities to come buy thereby making sales and thus revenue in a sustainable manner while maintaining “public trust”, the paper ought to improve the sports pages by restructuring the entire sport desk.

Key Words: ZCF, Viability, Co-operative, Solar Milling plant.

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ACRONYMS

CSP:	Concentrated Solar Power
DMC:	Department of Marketing and Cooperatives
FNDP:	Fifth National Development Plan
GIS:	Geographic information system
FSP:	Fertilizer Support Program
ICAP:	International Cooperative Alliance
IFAP:	International Federation of Agricultural Producers
MCDM:	Multi-Criteria Decision-Making
MCS:	Monte Carlo Simulation
NCDP:	National Cooperative Development Policy
PSRP:	Public Service Reform Programmed
SADC:	Southern Africa Development Committee
SME:	Small and Medium Enterprises
SMP:	Solar Milling Plant
SPSS:	Statistical Software for Social Sciences
ZCF:	Zambia Cooperative Federation
ZDA:	Zambia Development Agency
COMESA:	Common Market for Eastern and Southern Africa

CHAPTER 1

1.0 Introduction

This chapter lays out the study by bringing out its background, statement of the problem, general purpose of the study through the research objectives and questions. This chapter also outlines the significance and rationale of the study including its limitations and ethical issues that may arise. Cooperatives are businesses owned and controlled by the general membership and among other things members use cooperatives to do business like production supplies. Farmers use cooperatives to market and process crops and livestock and purchase supplies.

Cooperatives serve common interests of people for mutual benefit in the communities they operate from. They are complex organizations with unique principles, practices, member benefits, and structural characteristics. They exist in many segments of the economy today providing many kinds of services that benefit their general membership (USDA). The Department of Cooperatives is the regulatory agency of the cooperative movement in Zambia. In this capacity, the Department ensures that cooperatives adhere to existing cooperative legislation. It is also responsible for the implementation and administration of the newly formulated National Cooperative Development Policy in Zambia. To perform these roles, the Department has a Senior Cooperative Officer, based in each of the country's nine Provinces, who are responsible for:

- Monitoring compliance to the Cooperative Societies Act and specific bylaws of cooperatives;
- Facilitating cooperative training in the respective districts within the Province;
- Overseeing cooperative activities in the Province.

There is also a Cooperative Inspector in each of the country's seventy-two Districts that acts as the 'eyes' of the Registrar of Cooperatives. The Cooperative Inspectors, similar to their seniors at the provincial level, ensure compliance with the Cooperative Societies Act and by-laws of cooperatives at the district level. At the national level, there is the Registrar of Cooperatives that is responsible for the registration of cooperatives and their by-laws. In an effort to enhance effective and democratic cooperative management and to conform to Section 19 of the

Cooperative Societies Act of 1998 on by-laws, the Department of Cooperatives has produced ‘model’ by-laws to assist cooperatives in their preparation of this sub-ordinate legislation. This initiative is in recognition of low levels of competence, especially in primary cooperatives. A typical ‘model’ by-law, among other things, includes:

- A citation of the seven cooperative principles;
- Objectives;
- Issues to do with membership
- Organizational set-up;
- Conduct of meetings;
- Constitution of the board of directors and related matters;
- General regulations for transacting the business of cooperatives.

Despite the existence of this model, cooperators are usually involved in the preparation of their by-laws through a participatory process. Bearing the brunt of a liberalized economy. A performance review of the cooperative movement in Zambia, besides monitoring adherence to legislation, the Department is also responsible for training and publicizing cooperatives across the country. Whereas the Chief Cooperatives Officer develops training modules for cooperative leaders and members countrywide, the Principal Cooperative Officer is, among other things, responsible for publicity in order to ensure that Zambians appreciate the role and significance of cooperatives. It is in relation to this later role that the Department of Cooperatives has produced a number of brochures aimed at sensitizing communities on what cooperative are and what benefits can be derived from them. In regard to what cooperatives are defined to be, the Department has emphasized that cooperatives are economic organizations, just like other private businesses. However, it is observed that unlike most businesses organizations that are investor-oriented firms, cooperatives are owned by the members that are also users of the organization’s services. Therefore, a cooperative is a user-oriented enterprise, designed to maximize long-term qualitative and quantitative benefits to its members.

1.1 Background

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 grassroots projects and community development have been growing in a diverse set of countries. Chigumira, G. (2019) touches on assessment of demand in agro-processing machinery in the SADC region: A case study of the maize-milling machinery value chain in South Africa and Zambia and the government of Zambia in 2015 came up with various projects and among them was the solar milling plants championed by the office of the president and implemented by the Zambia Cooperatives Federation (ZCF) which was identified as a transforming vehicle for the rural communities and also bring development.

The Zambia Cooperatives Federation is the leading organization for cooperatives in Zambia, established under the Cooperative Law, 1998. It supports and facilitates various cooperatives across the country, acting as the voice of the cooperative movement. Zambia Cooperative Federation (ZCF) coordinates activities and advocates for members, assisting with accessing markets for their produce, affordable inputs, and infrastructure. Mulungu, K., & Ng'ombe, J. N. (2017) highlights sources of economic growth in Zambia, 1970–2013 and it is believing the solar milling project was a game changer for rural economies and its growth. ZCF also helps members maintain quality standards and increase productivity. The cooperative sector, including ZCF, is a significant contributor to the country's GDP and a major employer. ZCF also helps in bringing cooperatives together and trainings within the ranks of the cooperative movement, needs identified require some consented effort from the federation and other stakeholders in providing education and other supportive measures including raw material support where need arises.

Now public concern coming from Political and economic observers in Zambia today is the viability of the ZCF solar milling plants where business is concerned. The Solar Powered Milling Plants Project is part of the Presidential Milling Initiative that was set up in 2015. The main aim of the solar milling project was to reduce the cost of mealie meal and promote employment for the people of Zambia, especially those in rural parts of the country which has not been realized to date. According to the Zambia Cooperatives Federation (ZCF), through which the project is being implemented, the solar project total cost is estimated at US\$200 million and is mainly funded through a loan from the Development Bank of China. Initially, 2,000 solar mills were expected to be installed; that in 1958 for maize, five (5) for rice and thirty-seven (37) for cassava mills, but the number was reduced to 1583, out of which 1553 are for maize and thirty for rice.

This reduction is due to the reduced funds available amounting to US\$170 million, instead of US\$200 million as stipulated and also the addition of two provincial service training centers. six service training centers were completed in Chapata, Chroma, Chongwe, Serenje, Kalulushi, kasama, Mongu and Mufumbwe. The role of projects has significantly increased worldwide due to more improved developmental methodologies, and training in the field. Many studies still identify that the number of successful projects hasn't changed and attribute the change to project management concepts.

Cost of the Project Equipment

- i. Total cost of Installed Equipment = 70,000 US Dollars
- ii. Contribution by the beneficiary Cooperative Society = 30,600 US Dollars
- iii. Contribution by Zambian government = 39 400 US Dollars

Every cooperative that applies for a solar powered mill is required to pay a nonrefundable application fee of K500 and show proof of availability of land on which the mill and its accessories would be installed. Additionally, the applying cooperative should exhibit cooperative good governance practices like leadership structures, books of accounts and members with businesses. Each benefiting cooperative is required to sign a contract with the ZCF as the implementing agent and commit to pay a monthly loan repayment of K1,700 for fifteen years effective from the time the milling plant is handed over to the cooperative. On the first day of each subsequent month as indicated less than 1.2 on the lease agreement, the agreed terms and condition for the release of equipment is meant to be fulfilled, however it has never been honored and this resulted in debt accumulating. The return on the investment that was anticipated is on the contrary both in the community they are constructed and for the federation who are the collection agency mandated by law to collect the funds have been having difficulties, as a result many questions as to whether the solar milling plants is a Viable project, profit / Loss and cash flows from sales of the mealie meal has being the main issue of concern for some time both on cooperatives and the federation movement.

1.2 Statement of the Problem

Off-grid grain milling has the potential to improve farming efficiency, increase farmer revenue, and enhance food security in sub-Saharan Africa (Ndlovu, 2014; Ministry of Finance, 2020; Singh *et al.*, 2022). However, the recent solar milling project in Zambia has not met public expectations, with sales falling below forecasted levels. This is concerning especially

considering the high cost of procuring and installing the mills, totaling of \$200 million for 1571 milling plants which are distributed around the country.(Ndlovu, 2014; El-salam, Baiomy and Taie, 2019; Agyekum, Afornu and Ansah, 2020, 2020. Ministry of Finance, 2020; Singh *et al.*, 2022; Mahmoud, 2023; Mutume,2023). The ZCF has struggled to recover loans from cooperatives, with only 11.26% of the projected amount being repaid (Ndlovu, 2014; Munyenembe, 2015).

The difference between monthly target and monthly recovery was just too big and the realized funds were significantly low with regard to what was actually forecasted. This has raised the concerns among stakeholders regarding the viability of the solar milling plants. Munyenembe (2015) carried out research on the economic impact of the solar milling plants to the local people in Katete District, Zambia. The findings did prove to be negative on its contribution to the economic growth of the area. If all the installed milling plants were operational, it is reported by Corporative Development report (2017) that focused annual revenue was K2, 281,400 but only K235, 343 was actually realized. The lack of empirical evidence to support the feasibility argument for a solar project is a potential cause of the problem. A study is needed to evaluate the project's viability and compare it with actual sales to find solutions. The research addressed the issue of viability and the federation's ability to recover loans from cooperatives. The study focused on assessing project risks and determining if the solar milling plant would be profitable and worth pursuing.

1.3 Research Objectives

1.3.1 General Objective

The research project aims to assists in the assessment of the economic viability of the ZCF solar milling plants to rural communities and its ability to make returns.

1.3.2 Objectives

1. To establish the viability of the Solar milling plants
2. To evaluate the debt burden to ZCF from Solar milling cooperatives
3. To ascertain the performance and ability by ZCF management to collect loans

1.4 Research questions

1. What is the level of debt owed by co-operatives to Zambia co-operative federation?
2. Why is the Zambia cooperative Federation failing to meet the loan recovery threshold?

3. How viable are the solar milling plants?

1.5 Significance of the Study

Further, this research is significant because the benefits of ascertaining the viability of Zambia Co-operative Federation (ZCF) installed solar milling plants in Zambia can start a chain of reaction of positive effect that can be passed on to the upcoming main project players: Cooperatives, Contractor and Consultants. It is hoped that this research will be beneficial to contractors, engineering institutions, local government, public organization, ministries, upcoming local entrepreneurs, Zambia Cooperative Federation, construction industry and the community where these projects are undertaken. This can be achieved by applying theoretical concepts discussed in many literatures into practice in real projects. It is hoped that these findings will guide efforts to improve. The cooperatives are factors of national development because they enhance entrepreneurship, create jobs to the citizens and save part of the money they are paid in Zambia (International Journal of Multi-Disciplinary Research (2017) the research will enable the authorities to make decisions and formulate policies at this level in mind. Help in the change of usual practice.

The findings of this study will be used by government to get the insight of how monitoring and evaluation play a critical role in project implementation and how community participation and support is important in projects. The findings will also contribute reliable knowledge for vision 2030's development agenda that thrive to drive Zambia into a middle level economy by the year. It enables them broaden their understanding of community participation in decision making, implementation and monitoring of projects and its importance to community development, as well as national development. Lastly, the findings will be important to academicians and researchers as basis for further research.

1.6 Scope of the Study

This study will be confined to Zambia Co-Operative Federation. It will be confined to a period from 2018, 2019 and 2020. It will be confined to Northern, Eastern and Muchinga province where over 350 solar milling plants are fully installed and participants are picked among the general membership of the co-operative movement and these are provincial co-operative, district and primary co-operatives membership. The executives elected to lead the cooperatives are also part of the sample picked for the study. The study is rooted in the philosophy of pragmatism that

embraces a mixed methods approach to carry out the analysis and bring relevant information of concern to the study. The sample size was 280 respondents consisting of Cooperative members Community customers, Provincial federation staffs, Cooperative committee members from selected areas.

1.7 Limitations of the Study

It was assumed that, some participants are unlikely to participate in the research due to perceived sensitivity of the subject matter. It commands a relatively high level of education to fervently articulate significantly on the matter. Further, there is not much research done in relations to the evaluation of similar projects than the understanding of the theoretical framework of the subject. Hence, apathy and outright refusal to participate in the research is expected. The other could be that there could be limited literature available on the subject matter, further research needed to have an empirical roundup analysis. In addition, the researcher anticipates that the Zambian corporative entrepreneurs at the service centers may not have capacities, and capabilities to fully understand and implement the recommendations after the analysis of data thereof. The research further anticipates time factor limitations. It will also prove costly to extend the research, collect data in all provinces or centers and interpret findings, conclude and make recommendations and finally submitting the said, dissertation reports.

1.8 Format of the dissertation

This dissertation has been presented in six chapters as follows:

Chapter 1: The chapter included background information on the research topic, a statement of the research problem, the purpose of the study, research objectives, research questions, and the significance of the inquiry, the scope of the study, the dissertation arrangement, and a chapter summary.

Chapter 2: The chapter discussed the literature that has been written about this subject. The concept of small-scale solar milling plants and their viability. The chapter analyses previous study identifying gaps and limitations to help build a better research outcome.

Chapter 3: Provides the theoretical and conceptual frameworks that investigated the relationship between the independent and dependent variables. The chapter went on to detail the variables' operationalization, previous study, pertinent research.

Chapter 4: The chapter three outlined how the research will be conducted by clearly stating the research philosophy, approach, study design, target population, sample size and sampling techniques, data analysis, and finally a chapter summary.

Chapter 5: Data analysis and presentation. This chapter presented the obtained results and provides analysis as set out in chapter three.

Chapter 6: Discuss: This chapter discussed the findings as set out in chapter four in line with the objectives with reference to literature review.

Chapter 6: Conclusion and Recommendation: This chapter provides the conclusion to the study based on the study objectives and also provides recommendations based on the findings.

1.9 Conclusion

In this chapter, viability of Zambia Co-operative Federation (ZCF) installed solar milling plants and community-based business models were covered in detail. Solar milling and Cooperatives were introduced and their importance to poverty reduction and economic development was highlighted. The context of the research problem, its significance, aim, objectives, hypothesis, problem statement, research questions, and study design were all reviewed in this chapter. As a result, chapter one gave the reader a thorough introduction to the research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents relevant literature about effective debt collection strategies in accordance with the objectives of the study as outlined in 1.3.2 of chapter one.

2.1 Business Viability and Performance of solar milling plants

The first goal of any business or cooperative is to generate revenue. Without earning enough money, businesses simply cannot successfully make it and cooperatives are no exception. From inception, cooperatives have tried to deal with small adjustments, but they are now at a point where something must be done. Earlier investigation by MakanDay (2021) published in partnership with ZAM-net Foundation, revealed that the plants were already facing challenges, ranging from non-availability of spare parts to dysfunctional central control systems. And from the farmers point of view the major Concerns about the massive loan and its much-feared payback arrangements as outlined in the signed contracts has been a thorny issue from the beginning of the project, but ZCF pressed ahead, forcefully arguing its cooperatives into agreements and supplying the plants. Kepson Lungu, chairperson of Kasongo Cooperative in Chipata from inception and registration of the project when ZCF installed the milling plant at Kapachi. Said farmers are not benefiting anything because ever since they were installed, they have never worked to the expectations of the people,” he said. “You know those solar hammer mills came without batteries, so the problem which is there is that, when any person goes there to grind, it takes hours for it to finish one bag, so in a day it can only manage maybe three or five bags because solar power is not enough for it to work effectively,” he added.

Eastern Provincial Coordinator, Suzgo Zimba admitted that some of the mills are not working but placed the blame on cooperative management’s failure to keep them running. A business can be profitable when all stakeholders are able to get good results and 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 a cooperative can meet those needs and generate revenue. Create a system that will help determine the viability of the business further when all the systems described above are completed, the cooperative project is expected to run

smoothly and produce good results. It can be done also if co-operatives can maintain a high level of quality by providing good products that meet consumer expectations.

2.2 The level of debt owed to ZCF by Co-operatives.

The level of debt owed to ZCF by co-operatives as at 20th December, 2020 is K17, 584,600 (ZCF Board report, 2020). The old debt refers to all the debt coming from the past financial years not collected and proving to be a challenge for loan inspectors to recover fully. The dictum: “Commitment to development” suggests that rural support enhances economic development. A viable business model is fundamental to the success and long-term survival of any enterprise or co-operative (Magretta, 2002). However, designing a viable business model is a complex task especially when the business operates in a rural set up. According to Chigumira, G. (2019). Assessment of demand in agro-processing machinery in the SADC region: A case study of the maize-milling machinery value chain in South Africa and Zambia points out that agro processing is crucial on the development of the rural set up.

2.3 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 (Ndlovu, 2014). 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 (Times of Zambia, 2019). 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 (Munyenyembe, 2015). 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 (ZCF, 2021). 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 grain, sand, or corn bran. During contract milling, operators always process flour according to the following steps: 2. $40/125 \times 100 = 32$ 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.

2.4 Overview of ZCF

Zambia cooperative federation is the apex body of all cooperatives in Zambia (Munyenyembe, 2015). It was established under the cooperative Act of 1998 and operates independently with the mandate to facilitate and provided and provides 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 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) (Ndlovu, 2014). 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 (Ndlovu, 2014; D’Souza *et al.*, 2015; Singh *et al.*, 2022; Mahmoud, 2023). 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 (MAL, 2020). 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.

2.5 Solar Milling Machine

The installed solar milling plants are by nature presidential Initiative that was done under the former President of Zambia Mr. Edgar Chagwa Lungu. This initiative was conceived after the visit to China by the president in 2015. The Solar milling plants were procured through a loan from China under the China Development Bank and the plan was to install a total of 2,000 machines in all the ten (10) provinces of Zambia. Solar Milling Mill machines driven by solar energy is a complete equipment designed by Beijing Bumu International Engineering for Zambia and first of its kind. It offers an affordable system driven by solar energy to facilitate appropriate cereal/food processing technology for the benefit of smallholder in our rural communities of Zambia. The milling equipment are installed in rural communities where there is no electricity grid line (A El-Salam, 2019). This Solar Milling equipment guarantees the possibility to obtain edible mealie meal extracted from maize and other different kind of dry grains such as cassava from Luapula province, rice from western region of Zambia. Due to its innovative design, fineness and coarseness is achieved very easily through a side opening gate. Extraction rate is 80%. When fully driven by solar energy and on a good day, the mill can run up to five (5) hours daily with favorable radiation conditions. So, output on a good day range from ten (10) to fifteen (15) by 25kg bags per day of very fine mealie meal. (Sharma, 2022).

The communities at large are free to use the facilities to mill their maize at a lower price affordable to all. As per record the solar milling project is new, and Zambia is one of the first to have installed the solar milling. Other countries like Malawi and Zimbabwe are using Zambia's case as a learning focal point on how the project implementation was done and success recorded their after. The solar milling program seeks to support economic activities in the community by processing their produce as a main and was expected to create about 3,000 jobs for local people. Apart from milling maize for sell, the plant also mill maize for other people as well at a minimal fee, sell maize bran, a by- product in the milling process that would be sold to farmers and local

people who would use it as feedstock for their animals. There are three different types of solar milling machines supplied to Zambia cooperative federation (ZCF). The first-generation machine was the first one to be supplied to Zambia. This machine has three compartments which is used to hold either grain, grit or maize bran. The machines have a Pneumatic system able to filter dust from air and its central control system is able to switch off the roller the fan, roller mill and the extractor. The extractor normally separates the maize stocks which have been grounded(grinded) into various components.

- Maize grit (coarse and fine)
- Flour (mealie meal)
- Bran.

Under the toll milling, operators always follow the following steps in processing the mealie Meal. These include the following.

1. Weighing the maize and then clean thoroughly.
2. Record the quantities per run put all the grain and condition it.
3. Grind all the maize and portion the mealie meal according to maize delivered.

Extraction Rate on maize involves a measure of the percentage of the grain that is made into mealie meal during the milling process, sharing mealie meal therefore involves the following ratios.

1. $50/125 \text{ by } 100 = 40\text{kg of mealies meal to } 25\text{kg.}$
2. $40/125 \text{ by } 100 = 32\text{kg of mealie meal and what remains is maize bran.}$

The second-generation solar milling machines (BMLM-2-00) manufactured by Beijing Bumu International Engineering Company of China. The second solar machine comes with additional features. The start command has a dashboard display which has four (4) options on it. These include a pressing button for opening the operation. Press manual for testing, button for setting and another one for sensors. This solar machine has the capacity to do 125 kg of maize meal per hour and power consumption is 8kw. The second-generation solar milling machine is the improvement from the first machine and uses air to Pneumatic system to transport or move materials. There is also a third-generation solar milling machine (BMLM -3-00). This transport material mechanically. This new design can coordinate with other systems, intelligently accomplish all kinds of working system device that milling can require. It mainly consists of main console, sensors, signal line and power line. The other additional feature that comes with

the third-generation solar machine is that it has two (2) Distributors which help in separating grains. This system forms an alternative power source in places of no electricity and where the population is scattered with the need to produce only a limited amount of milled meal daily for a small family. The system consists of a photovoltaic array, mounting frame, energy storing device, inverter, charge controller and a portable domestic mill of about 10 kg maize milling per hour (Times of Zambia, 2019).



Figure 2.3: Solar, Milling Machine

2.6 Performance of Co-operatives in Zambia and Role of ZCF

For the past 25 years, Zambia Co-operative Federation and the entire co-operative movement in Zambia have under gone turbulent times that have affected its operations. This has resulted into cooperatives making insignificant contribution to national development. This is notwithstanding the fact that during the first Republic the Zambian Co-operative movement was rated as having been the 3rd largest employer. The first largest employer in this respect was government and its parastatals and Zambia Copper Consolidated Mining (ZCCM) having been the 2nd largest employer. This level of employment could in essence mean that the co-operative movement's contribution could have ranked 2nd from ZCCM in terms of its contribution to the country's

Gross Domestic Product (GDP). (James Chirwa. Presentation to government, 2017). The history of co-operatives in Zambia dates back to pre-independence. The first co-operative was formed in 1914 and it was a farmer based co-operative. The purpose of forming this co-operative was to help the members of the farming community coordinate the marketing of their agricultural produce to the copper mines on the Copperbelt and Katanga provinces.

There were some business opportunities existing in the mining industries for the supply of food stuff and in order to strengthen their bargaining power, they knew that approaching the mines individually was going to work against them in terms of bargaining power, instead they opted to deal with the mines under the umbrella of a co-operative enterprise. As can be noted, the formation of the first co-operative society was business driven as a Private Sector Initiative, taking advantage of a huge market that existed in the mines. In order to coordinate and regulate co-operative enterprises, the then Federal Government introduced what was then called “The COOPERATIVE ORDINANCE” (AN ACT) and the Department of Marketing and Cooperatives (DMC) was established to enforce the Cooperative Ordinance. The DMC was charged with the responsibility of registering and regulating cooperative societies. This continued even after independence and by 1970 an Act of Parliament was passed which now regulated all matters relating co-operative development. In this new Act Government’s and ZCF’s oversight role was clearly pronounced to the extent where in exercise of its oversight role government participation in policy making process at each level of the co-operative movement in Zambia by a government nominee from each board as ex official. At independence in 1964 there were 200 sustainably operating co-operative business enterprises, and the new government immediately embarked on an aggressive program of promoting the formation of co-operatives as a vehicle to stimulate the social and economic development, especially in the rural areas. In 1965 President Kaunda declared Co-operatives as a Mass Economic Empowerment Organization, through a pronouncement made at a public rally in Chifubu Ndola, (“The 1965 Chifubu Declaration”).

2.7 Challenges faced by Cooperatives.

There are several challenges faced by the cooperative federation which are similar to the ones in social security sectors. All of them have one thing common that is to do with collections of contributions, loans, pension funds and medical insurance schemes. This challenge is similar to federation challenges on loan recoveries. The second report of the Committee on co-operative

development indicated that delayed remittance of loans and payment was one of the challenges faced by institutions mandated by law in Zambia, especially public institutions.

HO. Okundi (2011) conducted a descriptive research in Kenya on the SACCO cooperative group and the study comprised of all general membership in Nairobi, registered in the role of co-operatives. The data was collected through the use of Questionnaires which were circulated to the treasurers or managers of the SACCOs sampled. The study concluded that SACCO suffered challenges in meeting loan requests by the members partly due to the Long term investments they engage in. Members of the SACCOs preferred loans from the bank to the ones from the SACCOs due to the speed within which the loans are disbursed and also due to the fact that amount of loan awarded is not pegged on saving as is the case in SACCOs. The study recommends that SACCOs should change their mode of recovery of loans so that an equal amount is deducted every month until the loan is cleared. This scenario is not different from ZCF, the general membership has come out on several forums that the monthly repayments are way too high in comparison to sales recorded, some even went on to request for breakdown of the K1,700 into two instalments as the business sales does not support such repayments and remain with little for other operations.

2.8 Factors Affecting Consumer Behavior

Customers are the principal priority for any business including those in cooperatives. Their behavior with which they operate will depend upon the extent to which understand the quality of the products processed by the milling plants in their community. Any business that is ignorant of consumer preferences and availabilities of the products whenever needed in the area can't fulfill its obligations in a meaningful and responsive manner (Schiffman L., 2008) The study of Consumer behavior includes what they buy when in need, why they buy, how often they buy, when do they buy and from where they buy (Schiffman L, 2008). Open- minded consumer-oriented approach is imperative in today's diverse global marketplace, so any cooperative competing in the market need to identify and serve its target market, minimize dissatisfaction on product experience and stay ahead. Meanwhile, there are various other factors influencing the purchases of consumer such as Personal experience on the products might affect consumer buying behavior and include, Social, Cultural, Personal and Psychological in nature.

2.9 Viability of the Solar Milling business model design framework

Designs for the solar milling plant decision arrived at on consensus by both the developers and the buyers, it also assumed to have complied with all environmental concerns from most provinces except western province which farm mostly Rice, hence the decision to send only milling plants designed to deal with rice only. The choice of materials that were picked to construct milling plants involved taking into consideration the end products, raw material suppliers who are the farmers and the consumers in general who buys the mealie meal. Design principles were followed through to ensure the project become viable and enable all stakeholders in the process content and agreed with the overall outcome (Chesbrough et al., 2006). Viability refers to a reliable supply of whatever sustains the operation of solar milling project. The operations of the milling process also need to be coherent (Al-Debei & Avison, 2010; Casadesus - Masanell & Ricart, 2011) in that value proposition on production should aim at achieving low cost on production and also viable in terms of revenue generation: A solar milling plant is viable when all the cooperatives are able to sell their mealie meal produced, make profits and that all stakeholders involved benefit (Chesbrough et al., 2006).

2.10 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. India 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) to install solar milling machine under the small, medium enterprise and cooperative development by Minister Sithembiso Nyoni. (Herald newspaper,2016). Financial growth for the rural communities is the main target to improve trade and business through the SMEs (Ndione, 2020) and financial independency of cooperatives through small and medium-sized businesses. Several countries have been working on solar milling projects to provide communities with access to affordable and suitable milling services. These projects have been beneficial for countries that have diligently given support to their rural communities where access to electricity a conventional milling service maybe limited. In Kenya with organizations such as green zone Kenya (2019) they are implementing solar powered milling stations.

These projects are seen to increase the efficiency of grain processing Kenya and have contributed to reducing on the time required for process completion by traditional milling methods. In Zimbabwe, the economic policy analysis and research introduced solar powered milling solution to address food security and reduce milling costs. The project aim was to support small scale farmers by providing them with access to affordable milling services. For instance, according to Helicon, (2023), He assessed the feasibility of Zimbabwe's Hwange and Lupane regions to host a large-scale Concentrated Solar Power (CSP) facility. The main goal of the study was to aid in identifying, classifying, and validating suitable sites for hosting a CSP facility. In this paper, suitable sites were identified and classified by coupling the multi-criteria decision-making (MCDM) technique (specifically the analytical hierarchy process, abbreviated AHP) and geographic information system (GIS) software. The study findings revealed that the land available for concentrating solar power in Hwange and Lupane is 1792 km² (5.6% of the study area) and 3771 km² (11.9% of the study area), respectively. A Monte Carlo Simulation (MCS) of the theoretical power potential revealed that suitable sites in Hwange and Lupane could technically generate power ranging from 380.0 TWh/year to 477.5 TWh/year and 878.8 TWh/year to 1125.0 TWh/year, respectively. The CSP facility without a thermal energy storage (TES) facility has a \$ cost per kWh of 0.1879, while the CSP-TES hybrid costs 0.1468. The LCOE for CSP without TES and CSP with TES is \$ 0.0679 and \$ 0.0268 higher than Zimbabwe's electricity cost, respectively. Overall, results implied that Lupane is an excellent location for CSP facilities and supports policymakers in establishing renewable energy tariffs, resulting in economic and sustainable development.

Munyenyebe, (2015) conducted a study aimed at assessing the economic impact of the solar milling plants to the local people in Katete District, Zambia. The specific objectives were to assess the performance of the solar milling plans, the effect of solar milling plants on mealie meal prices on the local market, the effect of solar milling plants on job creation in the district, and to find out challenges that co-operators are facing in managing the solar milling plants in the district for economic development, suggesting measures to be put in place to see to it that the program was sustainable. The research employed a qualitative research design, and extensive literature reviews were conducted in order to have a broader understanding of the research. The main findings of the research were that the hypothesis was rejected because there were no

immediate economic benefits of the solar milling plants to the local people of Katete District. Following the results of the research, the solar milling plants were underperforming and underutilized in the district. Solar milling plants had no effect on the price of mealie meals in the district. Solar milling plants had a 40% effect on job creation in the district, and the study concluded that there were no immediate economic benefits brought about by solar milling plants in the district at the time of the study. A study aimed at the analysis of the set-up and economic, social and employment benefits of entrepreneur co-operatives were undertaken by Von Ravensburg (2011). The objective for the study was to learn how the model could be rendered useful elsewhere. The study was under the auspices of COOPAFRICA, a program that promotes favourable policy and legal environments, strong vertical structures such as co-operative unions and federations, improved co-operative governance, efficiency and performance covering nine countries – Botswana, Ethiopia, Kenya, Lesotho, Rwanda, Swaziland, Tanzania mainland and Isles, Uganda and Zambia from ILO office in Tanzania with technical support from ILO COOP. Though the study didn't specifically deal with the actual business model configuration of entrepreneurs' co-operative, it provides relevant concepts that are important in its design worth the review for this study. The author notes that there was a virtual void of descriptions of entrepreneurs' co-operatives in some parts of the world. This is true in Zambia's case where co-operative business model was confined to agricultural sector. Smart villages and Natasha Wilson report(2020) gives an evaluation on solar milling project done in Tanzania's rural Masai community and describes the results of tests conducted to assess the viability of an electric 3-phase 2.2kW Agsol hammer mill, imported from Kenya. The objectives of the tests were to assess the viability of powering the mill from off grid (solar) energy technology and centered much the speed of milling and quality issues or output. These two indicators of milling performance were investigated through variation and discovered that solar machine can be adjusted to run power output of lower than 2.2kw.

Lower than the current Zambian installed which need power output of above 5,000kw to 7,000kw. Meaning that it is able to free power output to be used for other projects within the community. Mbuzi in (2005) conducted a study with the overall focus of this study the small-scale maize milling business operation viability in Lusaka Province. The objectives were to understand the operational and managerial characteristics, identify the different marketing

strategies and to examine the strengths, weaknesses, opportunities and threats affecting the small-scale millers (SWOT analysis). The methodology used in the study was a simple survey in which purposive sampling was used. A structured questionnaire was used to collect information from the small-scale maize millers. This was complemented by secondary information from various sources. The general findings from the study were that the small-scale maize millers were lacking in education and this was both the employees and the owners. Other findings were that most hammer-mills were owned by the males and most of them had no employees who were trained in such fields as marketing, accounts and production. Most of the hammer mills were found to be located in Lusaka District and this showed that Lusaka had a high demand of products from the hammer-mills. The marketing strategies which were used were not good at all in the sense that they were inadequate and lacking a professional touch which made them not very effective. Most of them were producing roller and breakfast meal as their basic products. Most of the hammer-mills were repaired by the owner when they broke down. It was also found that the management structure of most small-scale maize millers was very simple in the sense that it only comprised of the owner-children-relatives-workers. In the absence of the owner the children or the relative took charge of the running of the business. Competition from the large scale millers and potential entrants into the industry were said to be the main threats and the weaknesses which was found and that most of them did not have trained personnel and they lack the basic education. Among the opportunities it was found that most of them had different plans on how to expand which showed that they were numerous opportunities in the maize milling business. One of the strengths which they possessed was the owner's equity which most of them had and this meant that most of them were safe from insolvency or liquidation since they did not borrow any money to start the business. From the above it can be concluded that a lot needs to be done concerning the small-scale maize milling in the sense that there is need to encourage more women to take up maize milling as a business and that the millers need to be trained at least in some of the basic management, planning, accounting, and marketing. The government should provide adequate extension services to target the small-scale maize millers so as to make sure that their needs are met. Lolojih, (2009) conducted the performance review study of the cooperative movement in Zambia. The findings of the study indicate that the cooperative movement is generally weak in regard to its income base and organizational structures. Most

cooperatives are either defunct or none performing. There are only approximately 100,000 members across 2,000 active cooperatives.

The cooperative movement lacks sufficient visibility and is not capable of providing effective representation for its members. Its confederation, the Zambia Cooperative Federation (ZCF), has not been successful at influencing government policy. Though the Cooperative Societies Act provides framework for the independence of cooperatives, the Government, upon realization that the movement is on the verge of collapse, is increasing its dominance on the cooperative movement. The proposed National Cooperative Development Policy increases the supervisory mandate of the Department of Cooperatives on the movement at District and Provincial levels. While the weakness of the cooperative movement is exemplified by the lack of financial capacity to sponsor its members to attend the Cooperative College for training, there is proliferation of opportunistic cooperatives that tend to be formed with the sole motive of gaining benefits from the Government's Fertilizer Support Program (FSP). Although such a program provides an opportunity for cooperators to improve their farming, it does not guarantee the development of sustainable cooperatives. To illustrate, some beneficiaries have been known to access subsidized fertilizer from the program, and then sell it for other uses. The study also indicates that potential for donor support is not effectively utilized by the cooperative movement, largely due to the lack of a well-organized macro-level partner. For instance, the cooperative movement is yet to attract and/or utilize foreign investment opportunities, such as that which has been created by the Rabobank's acquisition of a 49 per cent share in Zambia National Commercial Bank. Overall, the study has noted that the contribution of the cooperative movement to the country's socio-economic development does not seem to be significant. There are no formal or informal social protection systems and/or services made possible by the cooperative movement. In addition, the extent to which cooperatives are helping to create employment is not known. Internal constraints, such as the failure to hold regular Annual General Meetings, have stifled democratic governance of cooperatives. This has seen members become indifferent towards the activities of their organizations - a situation that means that the voice of the cooperative movement is not heard effectively. However, this paper argues that if the Government adopts a policy of supporting cooperatives, rather than controlling them, the cooperative movement in Zambia would have the potential to become a viable and sustainable instrument for national development.

Similar study has stated that Chinese investment and small-scale commodity producers in Africa and Zambia, in particular, has a part to play in investment opportunities) and another study in his assessment stated that SADC Roadmap identified agro-processing as one of its growth paths, there has been a need for concerted efforts among member states to arouse regional manufacturing competencies in agro-processing machinery, equipment, and parts and to leverage the full benefits of connections between the agriculture, manufacturing, and services sectors of the economy. More authors have different views on the development of agriculture in Zambia since Zambia still has the potential to expand its agricultural production, owing to its massive resource grant in arable land, labor, and water resources. Bordered by eight countries and being a member of the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC) encourages its market for agricultural produce. Another researcher has described the industrial partnership between China and Zambia mainly as involved in infrastructure development, productive capacity building, and training and education hence investing in solar milling plants. However, another research explains how knowledge management and competence in strategy development, management techniques, collaboration mechanisms, knowledge sharing, and learning, as well as knowledge capture and storage, can be utilized for economic and social development in this case, how would Zambia utilize this knowledge and UNCTAD explains that the bulk of ZDA investment work should be in sectors for which investors are not fully aware of the opportunities available. These are agro processing and tourism.as stated by one research; perhaps the most important opportunity offered by Chinese FDI in Africa is the increase of investment in transformation activities. It is also evident that China can be very responsive to complaints by Africa stated by on one research. States that Demand factors examined in the paper encompass the agro-processing subsector, local consumption of maize, machinery procurement, imports of agro processing machinery, equipment and parts, and levels of investment. Supply factors include supplier capabilities, types of machinery manufactured in the region, and the Zambian government support this idea. Hence one study on the Government can do much to address social problems. They are large and powerful, with access to almost every corner of society, and through taxes, they can mobilize vast resources. Even the governments of poor countries, where tax revenues are modest, can get international funds in the form of grants and low-interest loans hence Zambian Government investment in Solar Hammer Mills. Furthermore, the ministry was confident that once the

benefiting co-operatives are trained in the cooperative business model, the impact will be felt in the communities as a self-help group for poverty alleviation.

2.11 Critique of Existing Literature

Solar milling projects have gained recognition in rural communities as a sustainable and environmentally friendly solution where access to quality mealie meal products is concerned. It is also true that the solar milling projects have their own strengths and weaknesses. According to Uganda e-edition of monitor report (2020) titled solar milling: exploring market requirement to close the commercial viability gap, diesel mills have relatively low capital cost and good supply chain in terms of spares needed for maintenance and user friendly as they depend on diesel to run effectively. Other critiques of solar milling projects include the following,

Maintenance and Expertise: Solar milling units require regular maintenance and skilled personnel to handle any technical issues that may arise. In remote areas with limited access to technical expertise, maintaining and repairing these systems might become challenging. A lack of proper maintenance can lead to decreased efficiency and higher operational costs. In Zambia this has been the problem from the beginning and most of the locals trained could not grasp all technical details in full hence failing on the job.

Energy Storage: Solar milling projects are dependent on sunlight availability, which means that Milling operations might be affected during cloudy days or nighttime. Energy storage solutions, such as batteries, can mitigate this issue, but they can add to the overall costs and require careful management.

Milling Capacity: The milling capacity of solar-powered plants is limited compared to conventional Zesco grid-connected milling facilities. This limitation might hinder large-scale milling operations, making it less suitable for communities with significant milling demands.

Initial Investment required: One of the main challenges with solar milling projects is the high cost of setting up a solar milling plant and it requires significant financial investment which in most cases hinders governments or organizations.

2.12 Lesson Learnt and Gaps

Solar milling plants involve using solar energy to power grain milling equipment, providing an eco-friendly and sustainable alternative to conventional fossil-fuel-based milling systems found in our rural communities. Most of the studies reviewed revealed a contextual gap, for instance a

study by Munyenyembe, 2025 was Katete district as seen it was only limited to one district and focused on the economic impact of the solar milling plants to the local people in Katete. This shows limitation in terms on context and focused on the study hence it cannot be generalised to cooperatives and Zambia as whole, Similarly Mbuji, in 2015 study focused on on small scale farmers and challenges the face. From the results, it was determined that a lot needs to be done concerning the small-scale maize milling in the sense that there is need to encourage more women to take up maize milling as a business and that the millers need to be trained at least in some of the basic management, planning, accounting, and marketing. This study focused on challenges faced by cooperatives in Kenya (Okundi, 2011). on the other hand, the current study focused on the viability of Zambia cooperative federation run solar milling plants, and since the context is different there is gap that this study needed to cover, the previous study findings were limited in terms of variables, method and context. Hence information and insights on viability is still lacking in this study.

2.13 Chapter Summery

This chapter reviewed literature regarding solar projects implemented from different countries; the success recorded and also looked at ZCF implementation plans. In summary, record so far shows that a number of countries have begun showing interest and are already installing in the countries. Critiques also have demonstrated that the solar machines are expensive, and maintenance is an issue as there are few skilled personnel to repair the machines if not Chinese nationals. There are also lessons learnt from this project, its uniqueness and challenges faced in conducting thorough evaluations and documenting experiences can help improve future initiatives that work to improve solar milling plants.

CHAPTER 3

THEORETICAL AND CONCEPTUAL FRAMEWORK

3.0 Introduction

The theoretical and conceptual framework explains the path of a research and the ground it is firmly constructed. The overall aim of this framework was to make research findings more meaningful, acceptable to the theoretical constructs in the research field and ensure there is generalization.

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 build his/her own house or research inquiry. It serves as the foundation upon which a research is constructed. The theories that have been 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, the conceptual framework was developed.

3.2 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 systems (Aubin, 2004). 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. It assumes implicitly an “opportunistic” and “conservative” behavior of the system: a behavior which enables the system to keep viable solutions as long as it’s potential for exploration (or its lack of determinism). In any business set up people use this type of decision making to analyze facts or when decisions are difficult in nature. The researcher looked at the viability of the solar milling project in terms of cost of operations, impact to the society and federation, the general feasibility of the project in Zambia, timeframe 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 provide new insights into or ways of

understanding the viability of solar milling plants and improved 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.

3.3 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 claims that individuals have limited information processing capabilities that exhibit systematic bias in processing information. They therefore hold that behaviors like default on debt repayment are 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.

3.4 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 principle of viability has been utilized in other disciplines and its application has demonstrated relevance. In economics, viability theory has been used to study economic systems, resilience, economic growth and resource management. Management and decision making studies have also applied viability theory in complex systems.

3.5 Conceptual Framework

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. For easier comprehension of what the study entails the definitions relevant to the study should be highlighted.

3.6 Cooperative Variables

This means the characteristics of cooperative solar milling that can easily be identified with ZCF. Other variables identifying key constructs attached to viability theory relate resilience of the solar machine and ability to adapt and these play key role with analysis of the independent variables and its influence on the independent 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, meal-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.

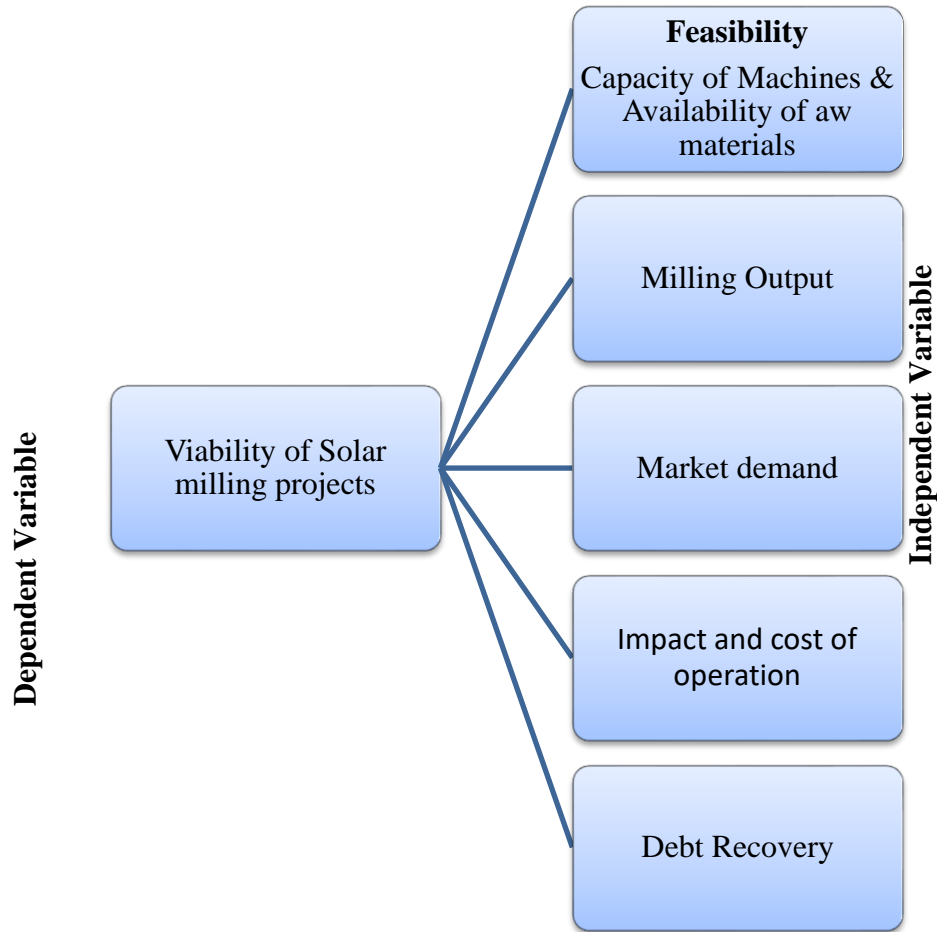


Figure 3.5. **Conceptual Model**
 Source: Author own design (2023)

3.6 Research Hypothesis

This study therefore, sought to approve or disapprove the following two hypotheses below:

Null Hypothesis (H₀): The solar milling plant project is viable and sustainable project.

Alternative Hypothesis (H₁): The solar milling plant project is not viable and sustainable project.

3.7 Operationalization of Variables

i. **Market demand and analysis:**

Determining the demand for mealie meal is cardinal and can help leadership of each cooperative to make projections of what to produce at any given time in that community. The leadership can easily analysis with accuracy all issues relating to finances. The rural market

and population is scattered, therefore the leadership will be able to analyze market trends and any growth potential in sales especially in summer time and these can be easily measured through recorded enquiries daily, weekly or on a monthly basis.

ii. **Cost Analysis:**

Cost components for mealie meal production startup costs for each machinery which seats around \$70,000 at the time including all other supporting equipment. Estimates of operational costs such as raw materials, packaging materials and labor if any.

iii. **Revenue Forecasting:**

Estimates of sales volume expected daily, weekly and monthly and pricing based on market demands in that locality. Consider seasonal fluctuations and market trends that may impact revenue especially summer calendar which starts month of May to August.

iv. **Risk Assessment/Debt recovery burden:**

This variable will identify potential risks such as debt burden and failure to collect loans and debt

v. **Operational Feasibility:**

Assess the technical feasibility of milling operations including equipment capabilities and efficiency. Evaluate the availability and quality of raw materials such as such or flour.

vi. **Regulatory Compliance:**

This variable will bring to light regulatory requirements related to milling operations, including permits, environmental regulations and standards.

vii. **Sustainability and Social Impact:**

Consider the environmental impact of milling operations and explore sustainable practices. Assess potential social benefits or impacts on the local community.

viii. **Financial Projections:**

Develop a financial model projecting revenues, expenses, and cash flow over the solar milling project. These also include sales from the selling of maize bran and toll milling charges.

ix. **Viability of the project:**

Measures as to whether the idea will make money, i.e. whether it will be profitable. The viability study is not about whether something is doable, but rather whether it is worth doing. In this study viability was measured by determining and measuring project feasibility, cost analysis, project

risks/ debt burden, sustainability and social impact, revenue forecasting, regulatory compliances and financial projection.

CHAPTER 4

RESEARCH METHODOLOGY

4.0 Introduction

Research methodology is the philosophical framework within which the research is conducted or "Foundation upon which the research is based" (Brown, 2006). Research Methodology chapter of research describes research methods, approaches and designs in detail highlighting those used throughout the study, justifying choice through describing advantages and disadvantages of each approach and design taking into account their practical applicability to our research. O'Leary (2004, p.85) describes methodology as the framework which is associated with a particular set of paradigmatic assumptions that we will use to conduct our research. This chapter focused on the research design, research strategy, sampling frame, sample size and sampling techniques, operationalization of the research, data collection techniques and data analysis methods.

4.1 Research Design

The research design used in this study is the cross sectional and mainly analytical and 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. 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. 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.

Table 4.1: Research Design Matrix

4.2 Research Method

Research Philosophy	Research Approach	Research Design	Research Strategy	Research Method
Pragmatic philosophy was adopted. Pragmatic researchers use a mixed-method approach and operational decisions based on ‘what will work best’, Creswell and Clark (2011)	Mixed method approach was adopted utilizing both quantitative and qualitative research approaches were used	Based on the research questions, the study adopted a Descriptive cross sectional Research Design utilizing both quantitative and qualitative research designs	Survey research strategy and Sequential, concurrent, and transformative strategies adopted using (Babbie, 1990)	Both open- and closed-ended questions, both emerging and predetermined approaches, and both quantitative and qualitative data analysis were used.
Target Population	Sampling Frame	Sample Size	Sampling Technique	Data Collection
Targeted Kasama, Chinsali and Chipata then other towns like Isoka, Mbala, Nakonde, Petauke and Katete focusing on communities around the Solar milling project, staff and committee members of the cooperative movement (ZCF)	Maximum variation sampling technique was used in selection process for participants from the communities who are the customers buying mealie meal from the Solar milling plant.	The sample size was 280 respondents consisting of Cooperative members, Community customers, Provincial federation staffs, Cooperative committee members	Purposeful and convenience sampling technique was used to collect qualitative data from cooperative staffs living within the vicinity of the milling	Questionnaires were used to collect quantitative data from participants. Document and report review was used to collect qualitative data

The template above is a research design matrix and provides a mixed method approach for data collection and analysis most appropriate in this research. The research will be conducted using both qualitative and quantitative in that it took advantage of the ability to finish tasks of each method used and also accomplish set objectives for each approach (Mishra & Alok, 2017). Considering the fact that this is a pragmatic study in nature, the tasks of the findings is to assess viability of the solar project and help build sustainable solutions to challenges facing the federations, as indicated, a mixed method approach will be used to collect, analyze and interpret data (James, 1979; Robson, 2011; Martens & Wilson 2012). This also helps in developing

correlational analysis of the different variables being studied. Therefore, this research was influenced by the systematic, scientific of positivist and post positivist approaches to research.

4.3 Research Population

The research was conducted in three provinces targeting communities around the Solar milling project and committee members of the cooperative movement. The target population for this study is members of the agriculture cooperative under ZCF operating from selected districts Eastern, Northern and Muchinga province. According to the Department of Cooperative Societies Registrar 2020, Eastern, Northern and Muchinga province has a combined total of about 1534 agriculture cooperatives with an average of 10 members per cooperative. This implies that the total target population for this study will be 15,340. It is also important to note that selection of population sample is key. Gschu (2004) underscores the importance of selecting a representative sample through making a sampling frame. From the population frame the required number of respondents is selected in order to make a sample and the ideal technique to be used is stratified random sampling. To establish the sample size the researcher will use Yamane equation. The formula takes into consideration the margin of error, the 95% confidence level, the population and the response distribution (Precision) (Yamane, 1967).

4.4 Sample Sizes

The sample sizes for each population category and for each district (Stratum) will be determined using the Yamane Formula Model. The determination of the sample size using Yamane sample determination Model is done as follows;

$$n = \frac{N}{1 + N(e)^2}$$

Where

n	required sample size
N	the total population
e	margin of error used was estimated at 5% or 0.05

Where:

N =15340

n =?

e =5%

Calculations below give both the targeted populations and their associated sample sizes based on Yamane Formula. Yamane Formula Model can generate a sample size for any size of the population which could be in form of even or odd number though it uses a fixed margin of error which is 5%.

$$n = \frac{15340}{1 + 15340(0.05)^2}$$

$$n = \frac{15340}{1 + 54.75}$$

$$n = \frac{15340}{54.75} = 280.18$$

n = 280 sample size

4.5 Convenience Sampling (Availability)

Availability sampling techniques was found to be ideal in that it relies on data collection from population members of the cooperative group available to participate in the study. Their information is key to this study especially sales records co-operatives document for decision making purposes. 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 cash flow process and production lines.

4.6 Purposive sampling Cooperative staffs

Purposeful sampling technique was picked and found to be useful in collecting qualitative data from cooperative staffs living within the vicinity of the milling plant and also because they observe, knowledge they possess in running the business and the experience in selling of mealie meal bags produced, that is how many days it takes to sell meals produced. (Proctor et al, 2009; Patton, 2002, Cresswell & Plano Clark, 2011). These evidence based staff members are also in a better position to guide with records and communicate to would be staffs, teach them an articulate and reflective manner (Spradley, 1979; Bernard, 2002). The research journey involves the researcher identifying individuals or groups of individuals who are willing to participate and

communicate the experience or opinion in an expressive and efficient manner understood by all. (Cresswell & Plano Clark, 2011).

4.7 Maximum variation sampling

The second technic used for this research was Maximum variation sampling technique in selection process for participants from the communities who are the customers buying mealie meal from the Solar milling plant. This idea was basically to help in capturing and analyzing the actual ideal why co-operatives in the region are not following lay down principles in loan recoveries repayment. In order to ensure equity of representation, this technique was viewed to be appropriate, as it allowed each sector to be represented. General membership of the co-operatives were given questionnaires based on maximum variation sampling in that region so as to conduct and generate sales performance and make attainable conclusions.

4.8 Data Collection

The research used both primary and secondary data. The primary data was obtained through structured survey questionnaires which were carefully distributed in 3 major areas in the three provinces under the study. The areas selected included Provincial cooperative union, District cooperative union and primary cooperative union and its membership for Kasama, Chinsali and Chipata then other towns like Isoka, Mbala, Nakonde, Petauke and Katete. The secondary data was collected through database review of the sales records for each cooperative in the districts from June 2018 to May 2020. In depth interviews were also conducted with the communities around the solar plants, customers, and federation staffs to further understand the behavior patterns of the people in the areas.

Table 4.8. Distribution of returned questionnaires

Group	Number
Cooperative members	100
Community customers	100
Provincial federation staffs	35
Cooperative committee members	45
Total	280

Table 4.8 shows that the researcher distributed 280 questionnaires to various categories of people from cooperative movement to ensure that as much as possible, the respondents represented all sectors concerned with solar milling operations. After collection and interpretation of survey data, the board of the federation held an urgent meeting to come up with solutions to act up on and to be implemented by management. This is because the solutions required participation of stakeholders in the communities and provincial populace at large. At the elective annual general meeting held at government complex in 2019 where all provincial leaders attended, management presented cooperative data to stakeholders of the federation to ratifies the action plan. This form of participation action research as a process was used not only to produce useful and sound information but also build capacity among participants. Capacity building was key in an effort to identify probable solutions to research questions and thereby in the process build techniques needed to successfully act on the findings. In this vain organizational research and its future perspective could imply that knowledge found in cooperative society could be useful for any future projects as a basis to use when resolving challenges. Solutions for the research were thus generated jointly by the stakeholders of cooperative movement as a social system (Mwanza, 2017)

4.9 Methods and tools of data collection

Primary data was collected through interviews and questionnaires. Questionnaires were designed to consider both open ended and closed questions. Open ended ones captured individual opinions, while closed questions are meant for short and direct responses. The data collected using these questionnaires were then coded and tabulated keeping with the objectives of the study. It was further analyzed using bivariate, percentages and cross-tabulation techniques. These were used to draw conclusions and establish facts relating to various variables as well as establish project viabilities of solar milling in the three (3) chosen provinces for the study. Respondents were given enough time to accurately interpret and understand the questions. reduced the possibility of misinterpretation thereby increasing the authenticity of the information. Interviews are through face to face session with the respondents to capture information that the questionnaire may not capture. Interviews are time saving because they provide immediate feedback. The methods of data collection are note-taking and also can be recording.

4.10 Data Quality Control

The data collected qualified to the tests of validity of the information. The data was valid because the questionnaires used in the study first pretested on a small sample within of hope of realizing its effectiveness in collecting all the required data. This helped the researcher to modify questions that are not clear during the pre-tests. Almost all interviewing techniques were used to cover up for the gaps likely left by the questionnaire.

4.11 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. Quantitative data from primary data collection tools was processed and analyzed using SPSS and Microsoft Excel. Thereafter the data was analyzed and presented statistically using simple statistical approaches such as frequency tables, pie charts, bar charts and making inferences. Correlation and regression analysis were conducted on secondary data to establish correlation and relationship between independent and dependent variables. For qualitative data, once transcribed, the data needs to be organized and stored in a structured manner for analysis. Thereafter the data was coded, the researcher then analysed the coded data to identify common themes or patterns that emerge across different participants or data sources. Themes represent meaningful patterns or concepts.

4.12 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.

CHAPTER 5 PRESENTATION OF RESEARCH FINDINGS

5.0 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.

5.1 Response Rate

The study had response rate of 80%, out of 280 targeted respondents, 225 questionnaires were returned only 20% were not returned. The response rate above 60% is regarded as good for the study, therefore, the response rate of 80% if excellent for this study.

Table 5.1 Return Rate of the Questionnaire

Item	Frequency	Percentage
Returned and found usable	225	80
Not usable	35	12.5
Not returned	20	7.14
Total	280	100

5.2 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 5.0. Summary of demographic variables

Cooperative Membership variable	Frequency	
	N	%
	Sex	
Male	170	60
Female	110	40
	Occupation	
Private Sector Employees	70	25
Informal Sector	150	54
Civil Servant	60	22

5.3 performance of the Solar milling plants

5.3.1 Awareness off Respondents on Solar Milling Projects

The information available by respondents on the solar milling projects was cardinal as it gave more understanding into how general membership of the cooperatives knew about the solar milling machines and how to operate them. The data collected from cooperative members running the projects business successfully was presented below.

Table 5.3.1 Awareness level of respondents

Category	Number	Percentage (%)
Operating instruction and safety	97	43
Booking	81	36
Extraction process on mills	47	21

Source: Interview questionnaires

5.3.2 Daily Recorded Mealie Meal Produced from Solar Milling Plant

As a factor in comparison, it was prudent to understand daily production done from the solar milling plant then compare with actual production of mealie meal bags done using ZESCO run milling plants on a daily basis in order to help appreciate performance and data was presented in table below

Table 5.3.2 Daily Recorded Mealie Meal Produced from Solar Milling Plant

Category	Number	Good Sunlight
1X 25kg	3	Little to non
1X25kg	6	Partial
1X25kg	12	Good

Source: Corp engagement report 2018

Table 5.3.3a: Financial performance of the Solar milling plants by provincial Collection Status 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 above 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 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 5.3.3b financial performance of the Solar milling plants by provincial Collection Status 2019 and 2020

Table below 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			
	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.

5.3.4 The profitability of the project

The figure below shows project profitability index trend from 2017 to 2020, although the trend has been going up, the PI trend is still below 1. This means each invested dollar is generating revenue of less than 1 dollar. If the profitability index is more less than 1, the project should be rejected

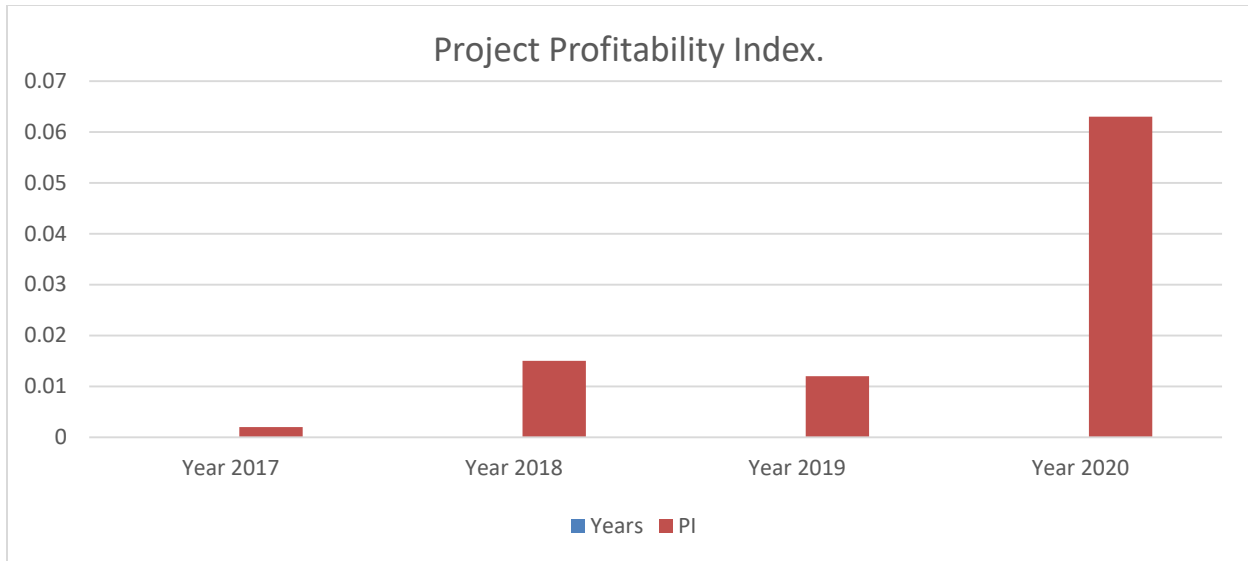


Figure 5.3.4 showing project profitability index

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

The table below illustrates 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

5.3.5 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	93	41.5	41.5	41.5
Disagree	37	16.6	16.6	58.1
Not sure	19	8.3	8.3	66.4
Strongly agree	37	16.6	16.6	83
Agree	37	16.6	16.6	99.6
Total	225	99.6	99.6	

5.3.6 Can the current daily production of mealie meal able to attain set profitability and pay monthly loans?

From the table below combined 58.1% of loan recovery officers think that the current daily production of mealie meal is able to attain set profitability and pay monthly loans. Only 25% of the Officers think that it is possible with the current production to attain set profitability and 16.7% are not sure. From the presented responses illustrated above it is true that it is impossible to collect all the old debt.

Table 5.3.6 Can the current daily production of mealie meal able to attain set profitability and pay monthly loans?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	75	33.2	33.2	33.2
Disagree	56	24.9	24.9	58.1
Not sure	37	16.6	16.6	74.7
Strongly agree	37	16.6	16.6	91.3
Agree	19	8.3	8.3	99.6
Total	225	99.6	99.6	

Primary data

5.3.7 Responses to experience on how viable is the solar milling business project under ZCF

The table below 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 5.3.7 Responses to the experience so far, how viable the solar milling business project under ZCF

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	75	33.2	33.2	33.2
Disagree	37	16.6	16.6	49.8
Not sure	37	16.6	16.6	66.4
Strongly agree	37	16.6	16.6	83

Agree	37	16.6	16.6	99.6
Total	225	96.6	99.6	

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

From the table below, 41.6% of the respondents strongly disagree and 8.3% disagreed that Community perception on the solar project is positive in the rural development communities and 16.6% strongly agree. Another 16.6% were not sure.

Table 5.3.8 with the current production runs from milling plants; is there hope with continuing running the project?

	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagree	75	33.2	33.2	33.2
Disagree	37	16.6	16.6	49.8
Not sure	19	8.3	8.3	58.1
Strongly agree	37	16.6	16.6	74.7
Agree	56	24.9	24.9	99.6
Total	225	99.6	99.6	

5.3.9 Raw Materials Availability

The findings of the table indicate that Community perception on the solar project has not improved, quality of the mealie meal in the community is the same and there is no development in communities. The results shows that 66.4% of loan recovery officers strongly disagree those raw materials like maize are easily sourced for mealie meal production by cooperative executives. A total of 33.3% of the interviewed loan recovery officers agree that raw materials like maize are easily sourced for mealie meal production by cooperative executives. The finding in table therefore implies it is not for cooperative executives to source maize, it all require finances to run properly.

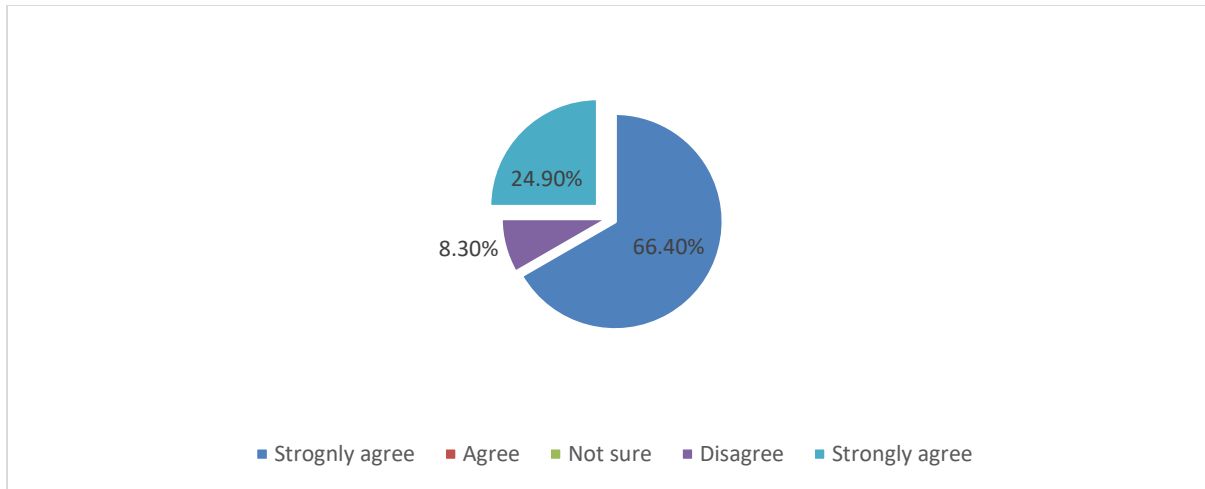


Figure 5.3.9: Pie chart distribution of the respondent's response as to whether raw materials like maize are easily sourced for mealie meal production by cooperative executives.

SUMMARY OF VIABILITY OUTPUT

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).

Table 5.3.10 SUMMARY OF VIABILITY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.15585
R Square	0.41148
Adjusted R Square	0.13012
Standard Error	667553.7
Observations	9

ANOVA

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

	<i>Coefficients</i>	<i>Standard</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>
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		<i>Error</i>				95%	95.0%	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								

5.4 Debt burden to ZCF from Solar milling cooperatives

5.4.1 Perception on the Inability to pay back the Loan

The figure below 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.

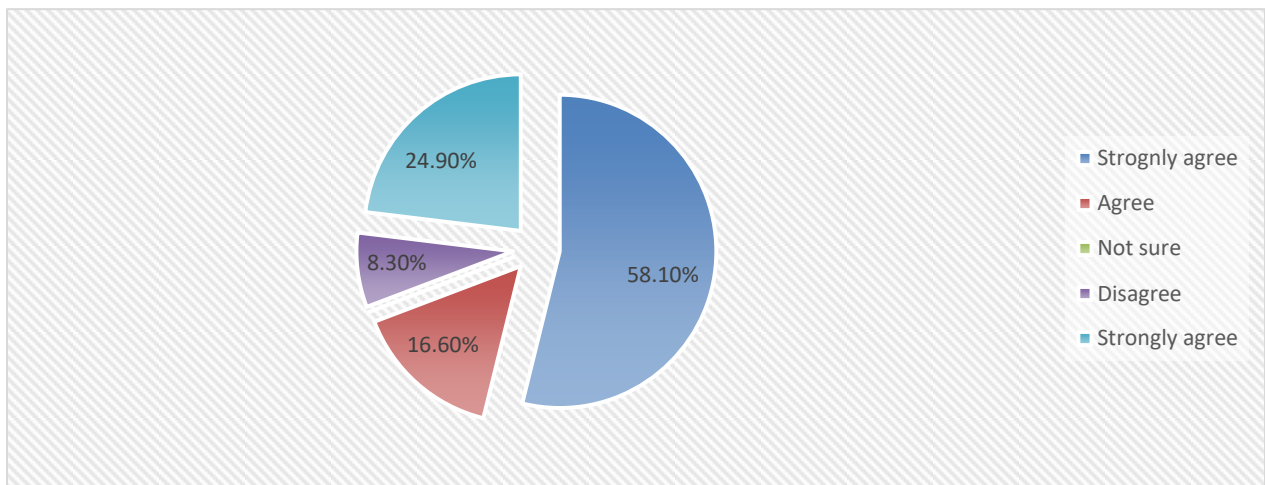


Figure 5.4.1 Pie chart distribution of respondent's responses on cooperative inability to pay the loans, could it be that the amount is too much considering the production capacity.

5.4.1 Current production runs

The figure below 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.

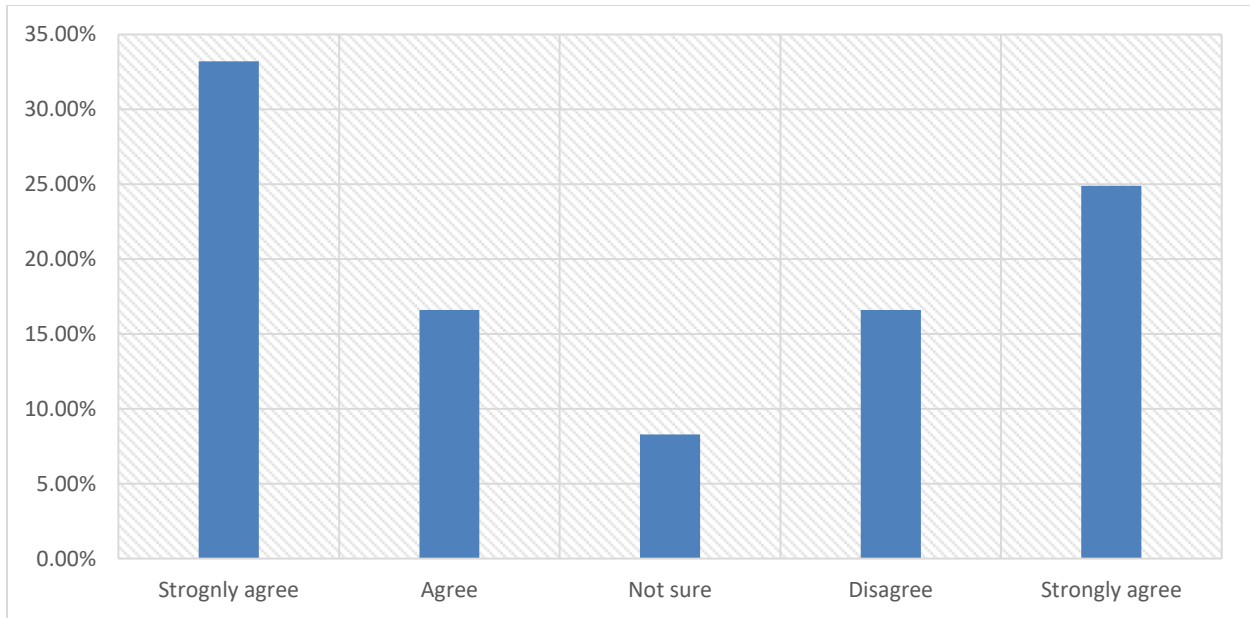


Figure 5.4.2: With the current production runs from milling plants, is there hope with continuing running the project

5.4.2 Implications about Loan Repayment Delays

The figure below shows 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.

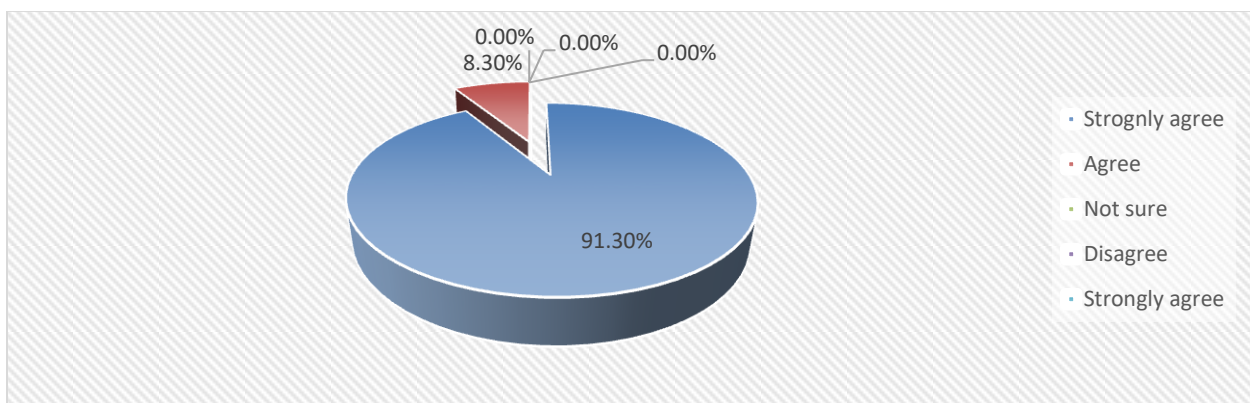


Figure 5.4.3 Implication of loan repayment delays on ZCF/China loan agreement on solar milling plants

5.4.3 Delayed Repayment impact

The figure below indicates 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.

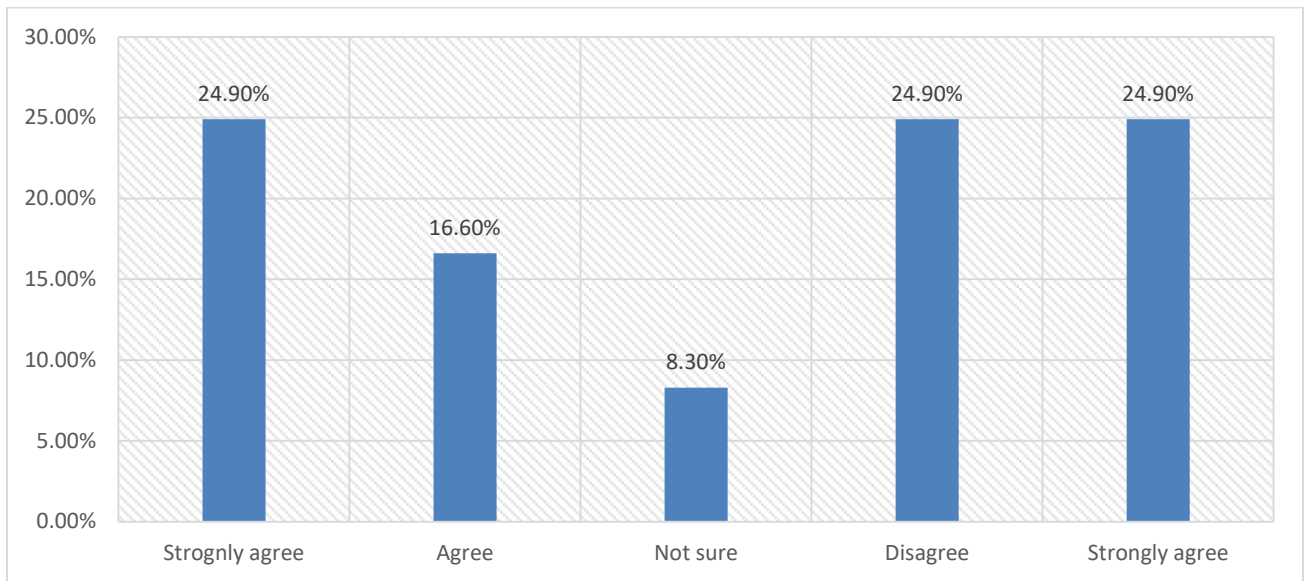


Figure 5.4.4: Responses to whether delayed repayments could be attributed to poor mobility tools provided by collecting agency/ZCF.

Source: Primary data

5.4.4 Payment Terms

The figure below 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.

Table 5.4.4: Responses as to whether amending payment terms can improve the effectiveness of loan collection Primary data

	Percent
Strongly disagree	8.3
Disagree	16.6
Not sure	8.3
Strongly agree	49.8
Agree	16.6
Total	99.6

5.5 Viability and ability by ZCF management to collect loans

This section presents and analyses data on the proposed potential debt collection strategies that can be employed by the federation to overcome cooperative loan collection challenges. This includes; Deb recovery, repayment history, capacity of machines, Binding cooperative contract, raw materials and system recovery.

5.5.1 Responses as to whether collectively validating the viability of the solar business idea was necessary.

Figure 5.5.1 indicated above shows that 99.6% strongly agree to the fact that validating the viability of the solar business idea is critical before the initial launch of the solar business. This implies that they all agreed to the question of validating the viability.

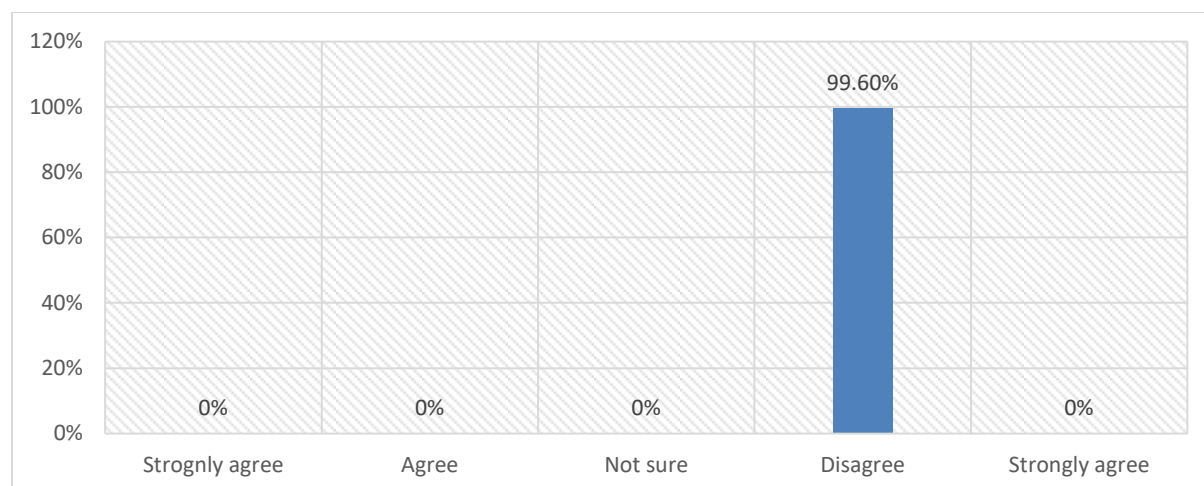


Figure 5.5.1 Responses as to whether collectively validating the viability of the solar business idea was necessary.

5.5.2 Responses as to whether making use of technology like mobile money can help improve loan collections.

Figure 5.5.2 below 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.

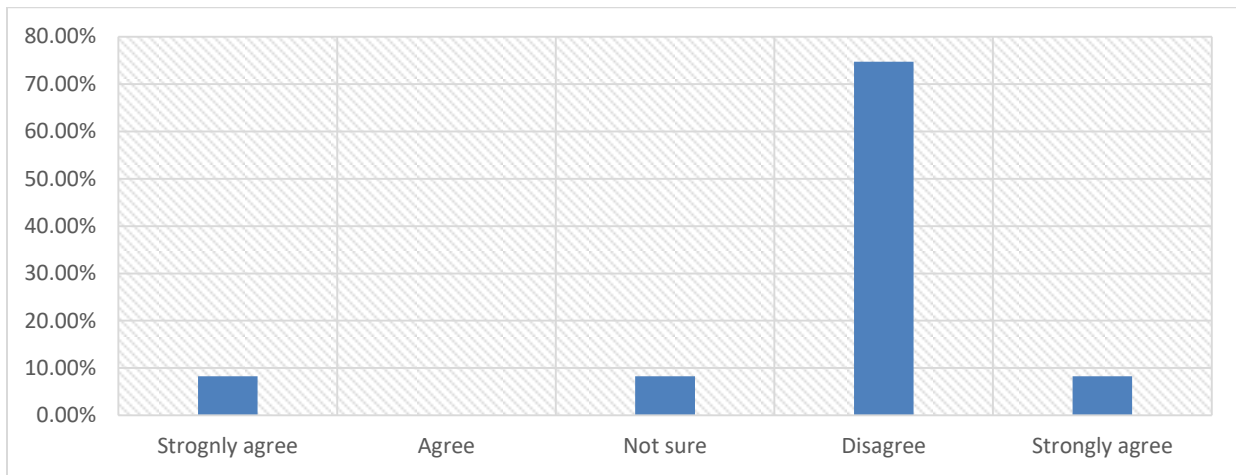


Figure 5.5.2: Responses as to whether make use of technology like mobile money can help improve loan collections.

5.5.3 Responses on use of the external debt collectors or collection agency can improve debt collection

Figure 5.5.3 indicates 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 is 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.

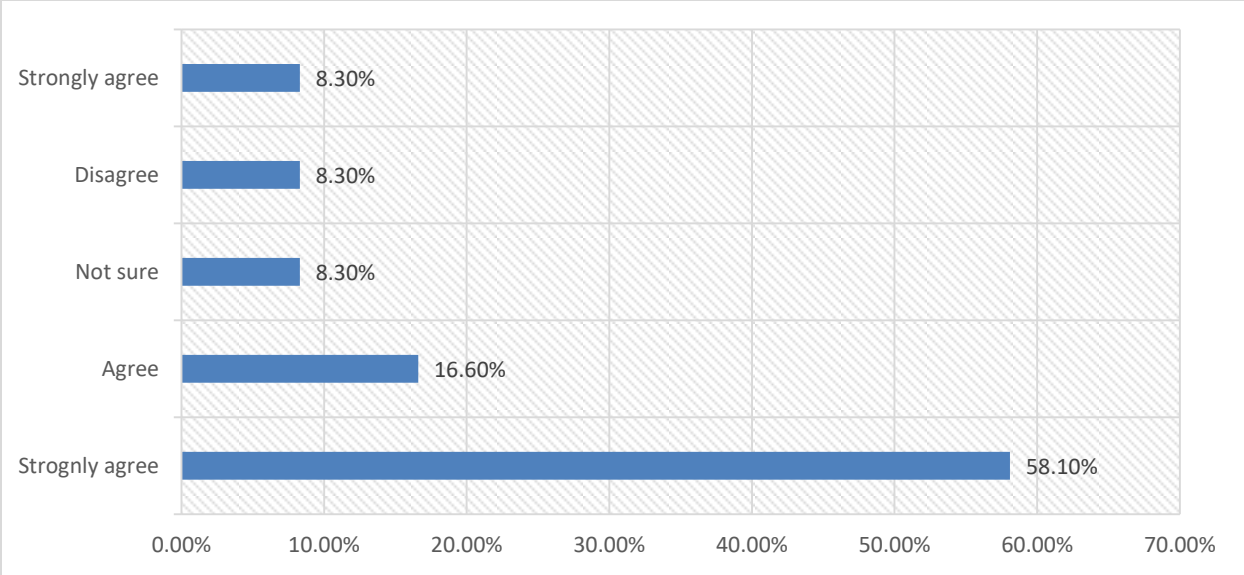


Figure 5.5.3 : Responses on use of the external debt collectors or collection agency can improve debt collection

5.5.4 Responses as to whether early contact with the clients can improve debt collection effectiveness.

Figure 5.5.4 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.

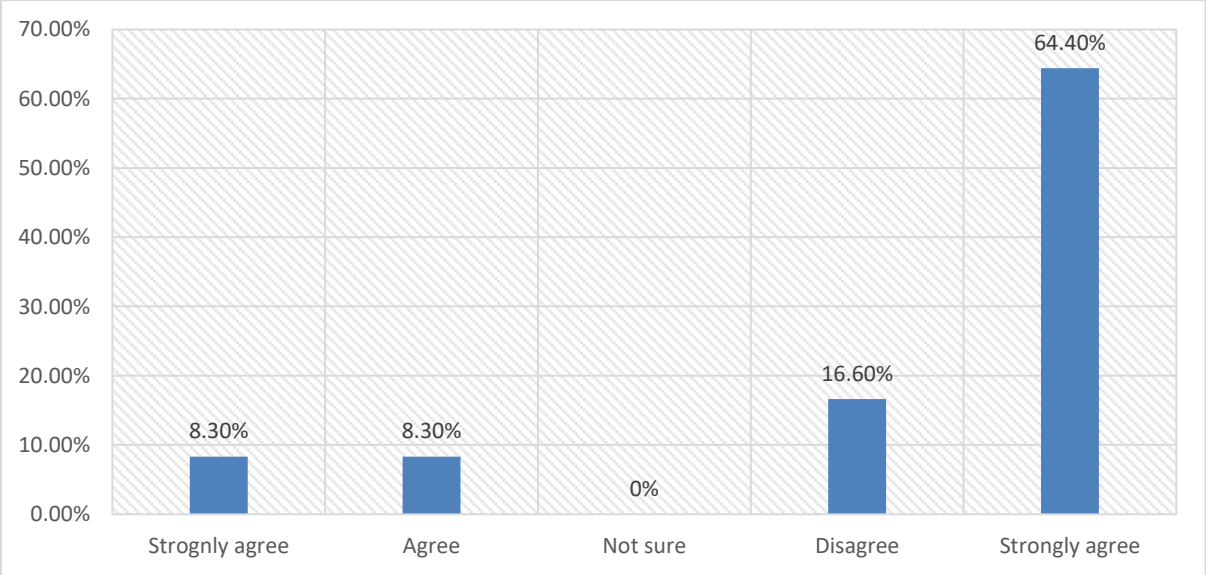


Figure 5.5.4: Responses as to whether early contact with the clients can improve debt collection effectiveness.

5.5.5 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 recovery. 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
(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

5.5.6 SUMMARY OF FINDINGS

The summary on establishing the viability of the milling plants

Cooperatives do not have operating capital to carry out business; they rely on member contributions in terms of maize mobilization. Contribution range from two (2) or three (3) from each member though not everyone honor such pledges due to family challenges. The other source is on tall milling which also very low in terms number of people coming to mill. People bring their maize to be milled. This is the only reliable source of revenue that could be treated as such though not enough to meet all bills that fall due monthly. Winter season is another problematic period that starts May, June and part of July and business wise it's a period that cause challenges on production as there is not enough sunlight for solar panels to generate enough electricity capable running the solar milling plant. Federation available resources are not

good enough to enable loan officers to effectively manage the over one thousand solar milling plants installed countrywide. The debt collection mechanism is also weak in that the federation does not prompt anyone to quickly respond to due payments as required by the signed agreement.

5.5.7 The summary of the findings on debt burden to ZCF from cooperative run solar milling plants.

Failing to collect due loans has not only affected repayment plans, it will also negatively have affected quality of service delivery. Secondly if not all outstanding amounts are collected, automatically render it as uncollectable bad debt. This may lead to government taking up on offsetting the debt owed to the republic of china. Bad debt would affect the client's service satisfaction. Clients for Workers compensation have various needs to be satisfied. These needs include lifetime medical aid, monetary compensation for the occupational diseases contracted or degree of disability suffered and full refunds for all the medical costs incurred on an injured employee. All these needs are not being satisfied if Workers' compensation fails to collect debt. Bad debt would affect the provision of relief to employees who contracted occupational disease or suffered injuries in the course of duty. All forms of relief to the deserving persons from Workers' compensation would not be available if debt is not collected. This means that employees would not enjoy the social security cover under Workers' compensation.

5.5.8 Ethical viewpoints

Success of any business, ethics plays a key role as stated by Milton Freidman (1970s influential economist) He published one article in New York Times titled "the social responsibility of business is to increase profits" (Friedman 1970). This applies to cooperatives as well in that profit must be prioritized and tracked to keep the business running. The idea that cooperatives need to be managed as a business will greatly improve business growth and also stakeholder value, the federation and government in general would benefit to a large extent and achieve the intended purpose. In addition, Peter Drucker (1954,62) points out that the need for any business is to attract customers" *This* view is accurate in that the solar milling project operate as business startup and the right strategy if implemented has the potential of driving even more profit in the long run. Peter Drucker's definition clearly demonstrates the need for a business to position itself

with quality products on the market and conveniently fulfil community needs. As a startup, cooperatives have a lot to learn and succeed in their business, perfect their products before distributing to the community customers. The cooperative methodology does also have some of its own inbuilt ethical viewpoints that need to be recognized early on when validating the problems before it and suggested solutions that could change the status in the communities. Customer demand assessment on periodic basis in line with production is to ascertain product lines produced within the community and also what is overall to be consumed. With this research, the researcher took into consideration ethical question and much to do with fake feedback on questionnaires. The fake feedback was seeded purely for development purposes and come up with feedback that addresses the concern at hand during the research. Possibility of leaving little fake and unrealistic feedback could still be account; it's not expected to raise any severe issues that could jeopardize the outcome.

CHAPTER 6

DISCUSSION OF RESEARCH

6.0 Introduction

This chapter presents the discussion of all the findings in relation to the literature review. It gives a summary of the findings based on the study findings and the objectives and then present conclusions based on both discussion, summary then finally it present recommendations.

6.1 Discussion

This refers to the discussion of all the findings in relation to the literature on the viability of the solar milling projects, uncollected loan burden effects to ZCF and lastly ability by management to collect. Each of these will be discussed separately.

6.2 Discussion on establishing the viability of the milling plants

In the literature review, it was established that ZCF as a federation is facing challenges in their loan recoveries that are due. The question that comes in now is the issue of viability of the project to sustain all monthly cost and remaining with operating capital. This has caused over 90% of the cooperatives struggling to pay loans. 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 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 ($0.0387 < 0.05$). Additionally, the findings of this research have shown that collecting officers from ZCF cannot collect all the current and old debt. A number of factors hinder them from collecting all the loans. From findings, it was established that cooperatives do not even have capital to buy raw materials like maize and packaging materials. They do not produce enough to sell and raise enough that can buy all the maize needed to meet monthly mealie meal expectations communities require. This result is similar to the findings from UKAID, 2020. Who reported that although stand-alone solar PV powered mills have market potential, they are not yet commercially viable or competitive with incumbent diesel mills? While the operational costs of solar mills are much lower than diesel mills, the capital cost of the mill and energy system remain a major barrier to market entry. Reducing costs by improving the energy efficiency of solar mill. According to Chabala (1996), the feeble equity base of virtually

all cooperatives is one fundamental problem that has jeopardized their viability and development. The past dependence on commission from the Government for their main activity of marketing maize was a major contributor to this situation. The resultant narrow economic base has since made it difficult for the cooperatives to effectively compete in the labor market for qualified and experienced manpower (Lolojih, no date; Kolcun and Zsolt, 2021). As a result, the quality of many staff has been poor

Additionally, member contribution in terms of maize proposal that was entertained from the beginning never actualized as most of the members only grow for consumption rendering the idea irrelevant. The other revenue source is on tall milling which involve community populace brings their maize to be milled at a fee though the amounts that are realized on monthly basis are not much. It is a challenge when it comes to winter season especially May, June and part of July. This period is challenging for solar milling production as there is not enough not sunlight to generate electricity capable of running the solar milling plants. These incapacitate the milling business that depends on solar for power generation living cooperatives in debts. The results obtained in this study are in line with the results obtained by other authors (Munyenembe, 2015; El-salam, Baiomy and Taie, 2019; Mutume, 2023).

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. Some cooperative chairmen take positions like personal to order and tend to ignore when their mandate expires. Ushering in new executives has always proven to be a difficult task. This has resulted in a number of committee members stop participating in all meetings and outright leaving these committees. Therefore, cooperative management needs 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. Awareness campaigns are needed in the market when solar mills are commercially launched; this can be done through demo sites at the distributors' offices and use of agricultural extension officers to disseminate the message. Further, on Viability, the study used profitability index from 2017 to 2020 to ascertain the viability of the solar milling project. Although the trend has been going up, the PI trend is still below 1. This means each invested dollar is generating revenue of less than 1 dollar. Since the profitability index is less than 1, the project should be rejected. This decision is also supported by (Mekonnen and Turner, 2019; Mahmoud, 2023).

The findings of the research also revealed that the issue of recommended pricing system of K75 from inception period of 2016 -17-18 as directed by ZCF which is less than the market price also created more problems for cooperatives. This instruction rendered the milling project unprofitable and non-viable implying that cooperatives need to produce a lot of mealie meal bags to sell to meet net value needed to meet all costs. Therefore, there is need for senior management to review the pricing structure, allow cooperatives to determine their pricing as opposed to the current position. This outcome is also in accordance with findings from other authors who argued that Solar milling plants had no effect on the price of mealie meals in the district. Solar milling plants had a 40% effect on job creation in the district, and the study concluded that there were no immediate economic benefits brought about by solar milling plants in the district at the time of the study (Munyenyembe, 2015). In addition, the findings also reveal that quantities produced daily are less than fifteen (15) as indicated from inception that machines can produce at least above 20 bags daily. This renders the project non-viable as capacity to produce is limited. Further, it has been shown through the findings that solar panels are vulnerable. Thieves in rural communities have been stealing and replacement has been coming with great cost. Therefore, there is need for cooperatives and federation to consider connecting the solar milling plants to the national grid, in that way production will be improved.

6.3 Discussion of findings on evaluation of debt burden to ZCF from Solar Milling cooperatives.

2018 board meeting report record indicated that non-payment of loans to ZCF has had affect to both repayments to Chinese bank and also its own operations. Meaning the institution will continue having financial challenges in meeting all its operational obligations that come with

routine visits to sites, repair works and above all securing packaging materials that are sold to cooperatives for mealie meal. If money is not collected, the federation would not have enough needed to provide and maintain the quality of services needed to be provided to the deserving cooperatives. All these expectations would be frustrated if loans are received monthly. Currently the contribution of the Zambian cooperative movement to the country's socio-economic development does not appear to be significant. The cooperative movement is generally weak in its income base and organizational structures. Many cooperatives are either defunct or non-performing. It has been observed that some cooperatives have been formed for the sole purpose of taking advantage of government support program. The "collapsing" of the cooperative movement in Zambia can be attributed to lack for planning for policy transition on behalf of the government as well as a manifestation of fragile cooperative institutions, whose internal organization was not robust enough to withstand the liberalization reforms. The continuing inertia exhibited by most cooperatives constitutes a serious threat to the development of an autonomous cooperative movement. Similarly, Munyenembe in 2015 also argued that The "collapsing" of the cooperative movement in Zambia can be attributed to lack for planning for policy transition on behalf of the government as well as a manifestation of fragile cooperative institutions, whose internal organization was not robust enough to withstand the liberalization reforms. The continuing inertia exhibited by most cooperatives constitutes a serious threat to the development of an autonomous cooperative movement. Of paramount importance is the need for the cooperatives themselves to appreciate the meaning and objectives of the cooperative model of enterprise. It is plausible to argue that the 'collapsing' cooperative movement in Zambia is a manifestation of fragile institutions, whose internal organization was not robust enough to withstand policy reform that had a diminishing effect on the revenue base. It is clear that ZCF has a huge task in terms of re-building its image and appreciable capacity so that it may recapture its role as a functional confederation. In order to enhance its visibility, as well as enlarge its membership, ZCF faces the challenge of re-aligning its bylaws to accommodate other types of cooperatives that are not agriculture-based. At the national level, it may be necessary for ZCF to seek an alliance with the Zambia National Farmers Union.

6.4 Discussion of findings on ascertaining the ability by ZCF to collect loans

Further, findings indicate that ZCF does not have capacity in terms of vehicles much needed to constantly visit all cooperative plants and attend to their complex issues that affect their

production process and business flow. For this project to succeed, leadership at ZCF need to lobby government to assist them with operational capital that should entirely be used to operationalize the project. This may include loan officers equipped with vehicles in order to assist them visit all districts and provinces where the solar projects are constructed and up and running. From research findings, loan officers are not equipped with tools such as vehicles as indicated enough to move around in rural communities to follow up loans. This outcome in line with Statistical analysis was done to determine the factors related to Zambia Co-operative Federation (ZCF) Debt recovery on the installed solar milling plants in Zambia, the results revealed that the main factors were 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 relate to debt recovery. Binding cooperative contract, raw material and system of were found to be statistically significant ($p < 0.001$). In light of the above, ZCF need to go back to the basics of the project, reorganize from the Apex body then down to cooperatives.

CHAPTER 7

CONCLUSION AND RECOMENDATIONS

7.0 Conclusion

From the study conducted, it is clear to see that the Federation command presence among rural communities who are members of the cooperative movement. Its performance as seen from the number of Solar milling plants constructed countrywide is a sign that the federation has good following among the rural community. In terms of profitability the study concludes that the solar milling project has not been viable and although the trend has been going up, the PI trend is still below 1. This means each invested dollar is generating revenue of less than 1 dollar. Since the profitability index is less than 1, the project should be rejected. Factors underlying poor viability of the project were coupled with unrecovered loans fail the project and all indication prove that the solar project is not viable in its current form, the design is contrary to objectives, resources are not in good condition to meet all repayments and make profits as evaluated by expert opinions, However existing literature on the design is fragmented, To address this gap, there is need for new technology with all crucial elements necessary for the success of the milling plants such as change to the design for it to have clear connection to the Wesco grid, adopting new business rules that has components of good governance and continuous improvements on training and developments. There is also the need to adopt a design science approach will be easy to understand and operate by village selected staffs to run the machines to ensure reduction monthly failures continuously recorded thereby increasing operating costs in running of the business, consolidate existing literature. In the end being able to demonstrate that what is produced can meet community demand daily, weekly and monthly as planned. Future design research should also focus on rigorously testing to evaluate and confirm it meets consumer expectation. Doing so will help cooperative solar milling enterprises develop. In addition, it will also help government in mitigating mealie meal supply in rural communities. On debt collection, strategies were reviewed from all literature review available and subsequently tested for effectiveness using the questionnaires which were administered to cooperative membership and then analyzed using SPSS. It has been established that there are various challenges that Zambia cooperative federation missed in their assessment planning to set up the project, these include insufficient support from senior management to attend to major issues raised by loan officers

when they go collecting loans, work overload, lack of specialized training in debt collection, It was also established that the failure to collect debt has negatively affected the quality of service delivery, inhibit meeting client's expectations, and the provision of relief to deserving persons. Various strategies both on viability of the business and on effectiveness to collect debt have been analyzed. These include making early contacts with clients, amending payment terms, promptly addressing client's complaints, providing statements and reminders, making adjustment to technology of the machine output, provide various platforms to make payments for debt, developing good relationship with accounts payables, understanding the client's situation, use of external debt collectors.

7.1 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;

- I. Federation keeping constant calls to cooperatives following up on monthly repayments. This should be followed with personal contact or meeting the cooperative committee members in person. The research finding shows that early contact with clients can improve loan recovery and reduce on margins owed.
- II. Secondly the Federation need to amend the payment terms for the outstanding debt. The Federation need to put up a payment plan that the cooperatives country wide feel they can manage taking into consideration the level of business recorded on monthly basis and reducing on the outstanding loans. (Kiyai, T. K. (2003) Terms of payment should be timely. Mealie meal is a fast-moving consumer good product therefore the quicker the product are sold the better and the period should be agreed by both parties for the cooperatives to mobilize the repayments. The findings of the research indicates and support amendments to payment terms as it was perceived on the loan recoveries amounts recorded (Loan recovery Journal Vol.7,2015). Therefore, the federation needs to review the current terms and conditions set for recoveries on Solar milling machines to see if they add change the collection results.
- III. Employ mature and experienced loan recovery officers who are above board and with respect in handling matters relating to collection of loans. Research has proven that

people are more likely to respond positively to your request or payment follow up when you engage them with respect when collecting these loans. The Federation need to constantly encourage and train loan recovery officers to be professional as they carry out their duties because being professional represent the organization, its culture to some extent increases the chances of collecting loans.

- IV. The Federation needs to also look at bulk SMS program as modern technology to use in reaching out to all cooperatives throughout the country. This system easily works well in areas where there is network and internet is not accessible. The findings of this research indicate that making use of SMS technology can help improve loan recoveries. Therefore, management and loan recovery officers should embrace technology. Loan recovery officers need to show commitment and keeping diary of committed dates for payment from cooperatives, this measure if followed through to the later can effectively and bring result.
- V. Philip Kotler(Kotler 13th Edition) categorically points out to the fact that when one is engaging a customer in a conversation on debt control of the conversation is cardinal and always ensure and you get answers that promise results on commitment. The research findings are that commitment on follow ups of loans from Cooperatives can improve loan collections. Loan recovery officers should ensure contacts are made on outstanding loans. They should also develop a healthy relationship with committees from cooperatives in that way it becomes easier for the collections to flow easily. Findings show that developing a healthy relationship with those making payments can improve loan collection effectively.

The federation should consider planning for quarterly/semester training program for loan recovery officers mostly in modern skills that would help push recoveries, also training them in critical skills will make efficient and effective in work planning strategies

REFERENCES

Alton R.G & Hazen J.H (2001), „As Economy Flounders, do we see A Rise in Problem Loans? Federal Reserve Bank of St Louis. 23.

Boye, K.G., (2007). An analysis of bank’s problem loans. Forges. Bank Economic Bulletin 78, 65–76.

Berger, A.N. and Udell, G.F. (1998). The economics of small business finance: The roles of private equity and debt markets in the financial growth cycles. *Journal of Banking and Finance*, 22, 613–73.

Bester, Helmut, (1987).The Role of Collateral in Credit Markets with Imperfect Information *European Economic Review* 31, 887-899. 44

Bester, Helmut, (1994).The Role of Collateral in a Moral Hazard Model of Debt Renegotiation. *Journal of Money, Credit, and Banking* 26, 72-86.

Cornelis N. Garters, (2001). “The Macroeconomic Statistical Treatment of Nonperforming Loans”, Discussion Paper, Statistics Department of the International Monetary Fund , December 1, 2001 Bonin J and Huang Y.P. (2001), “Dealing with the Bad Loans of the Chinese Banks”, *Journal of Asian Economies*, Summer.

Pann, J., Pühr, C., Schneider, M., Ubly, E., (2009). Modeling credit risk through the Austrian business cycle. *Financial Stability Report* 17, 85–101.

Yilmaz, S., Citer, E., (2009). Analysis of sectoral credit default cycle dependency with wavelet networks: evidence from Turkey. *Economic Modelling* 26, 1382–1388. 45.

Clair, R.T., (1992). Loan growth and loan quality: some preliminary evidence from Texas banks. *Federal Reserve Bank of Dallas Economic Review* 9, 22.

Dietsch, Michel and Joel Petey (2004).Should SME Exposures be treated as Retail or as Corporate Exposures? A Comparative Analysis of Default Probabilities and Asset Correlation in French and German SMEs. *Journal of Banking and Finance* 28, 2004.

Dimitros, Angelos and Vasilios L. Metaxas (2011).Macroeconomic and Bank-Specific Determinants of Non-performing Loans in Greece. *Journal of Banking & Finance*.

Fergal McCann and Tara McIndoe-Calder (2012). Determinants of SME Loan Default: The Importance of Borrower-Level Heterogeneity.

Latimer Asch (2000). Credit Scoring: A Tool for More Efficient SME Lending. New ideas from the world of SMEs. Vol. 1

Nkusu, M., (2011). Nonperforming Loans and Macro financial Vulnerabilities in Advanced Economies.

Rajiv and Sarat C. Dhal (2003). Non-performing Loans and Terms of Credit of Public Sector Banks in India.

Sanchis-Arellano, A., (2006). Household Debt Sustainability: What Explains Household Non-Performing Loans? An Empirical Analysis. ECB Working Paper. 49.

Sinke, Joseph. F. and Mary B. Greenwalt (1991). Loan-Loss Experience and Risk-Taking Behavior at Large Commercial Banks. *Journal of Financial Services Research*, 5, pp.43

Rhyne & Elisabeth (1998), "The Yin and Yang of Microfinance: Reaching the Poor and sustainability", *Micro Banking Bulletin*, No. 2, pp. 6-9. 17.

Joseph & Weiss, Andrew (1981), Credit Rationing in Markets with Imperfect Information, *The American Economic Review*, Vol. 71, No. 3, pp. 393. 20.

Goldberg, L.G., White, L.J., (2004). Cookie-Cutter versus Character: The Micro Structure of Small Business Lending by large and small Banks. *Journal of Financial and Quantitative Analysis* 39: 227-251.

Hansen, Karen T. (1982), ' Planning Productive Work for married Women in Low-income Settlement in Lusaka,' A case For Small-Scale Handicrafts Industry,' *African Social Research*.33 P. 211-223.

Dryden Press. Lipton, M. (1996)). Demystifying the development of an organizational vision. *Loan Management Review*, 37(4): 83-91.

E. Nkole,(1993). Access and opportunities: The need for support among small and micro scale entrepreneurs in Zambia, Lusaka.

Hailu, W. (2005). Microfinance in Developing Countries Concept and Practices *Microfinance Development Review*, Volume 5, No.1.

Adeyemo, R. (1984). Loan Delinquency in Multi-Purpose Cooperative Union in Kawara State, Nigeria. Bekele, T. (1995). Rural credit in Ethiopia; *Ethiopian Agricultural Problems of Transformation Proceedings of the Fourth Annual Conference on the Ethiopian Economy*. Addis Ababa, Ethiopia.

APPENDICES

Financial Data Collections from Solar Milling Plants

No	Provinces	Monthly Target	Monthly Recovery
1	Central	185,300	31450.00
2	Copperbelt	132,600	46065.00
3	Lastern	521,900.	26230.00
4	Lua pula	139,400.	8.120.00
5	Lusaka	108,800.	-
6	Machina	229.500.	8,170.00
7	Northwestern	178,500.	-
8	Northern	302,600	30658.00
9	Southern	448.800	84,650.00
10	Western	34,000	
		2,281,400	235,343

Source: Corporative Development report 2018