



Wealth Creation and Poverty Reduction Among Small Scale and Artisanal Miners: A Scoping Review of the Cooperative Approach

Richard Musukwa¹, Frank Mukwilima^{2,*}, Eustakio Kazonga¹, Bomani Mapeto¹

¹Department of Business, Management & Entrepreneurship, University of Lusaka, Lusaka, Zambia

²Department of Business & Management, Texilla American University, Lusaka, Zambia

Email address:

frmukwilima@yahoo.com (Frank Mukwilima)

*Corresponding author

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Abstract: This paper examines whether or not cooperatives increase and accelerate wealth creation among Small Scale and Artisanal Miners. The objective being to contribute to finding a common ground for policy formulation and implementation in the Artisanal and Small-Scale Mining (ASM) sector. The methodology adopted was a scoping review of published research papers. A comprehensive search was carried out using SCISPACE together with its extension copilot advanced search for articles published between 2001 and 2021. The results of the study were achieved by establishing linkages between Cooperatives and ASM performance. The search was limited to English language, and scholarly peer-reviewed papers. A total of 20 research papers were found to be eligible for review (based on our inclusion and exclusion criteria). This paper finds that there is a case for positive and negative impact of cooperatives on wealth creation and poverty reduction in the ASM sector. However, there is need for more empirical studies in the ASM sector on the impact of cooperatives. Further, studies conducted in other sectors that have shown positive results, there has been no attempt to show the impact of the phenomenon of the “Tragedy of the Commons” in the cooperatives and how it can be mitigated.

Keywords: Cooperative, Wealth Creation, Poverty Reduction, Artisanal Miners

1. Introduction

Cooperatives are increasingly being viewed as a means to enhance wealth creation and alleviate poverty among Small Scale and Artisanal Miners (ASM). Cooperatives tend to increase formalization, household income, and household assets; and reduce transaction costs in accessing technologies, financing and markets for members including those in the ASM sector [15, 24]. This is so because in most cases cooperatives are associated with collective action and social capital, hence are thought to be better placed in reducing poverty than other types of institutional innovations [33]. In the early years, cooperatives were largely viewed as a mechanism for stimulating rural development, and not necessarily as institutions for meeting the economic needs of their members [26].

It is from this background that Cooperatives are being proposed as possible strategies to create wealth, reduce poverty, and promote sustainable exploitation of strategic minerals such as gold for social-economic development in many African Countries. Whilst a number of studies have been conducted that show positive impacts of cooperatives in creating wealth, jobs and reducing poverty among poor populations in sectors such agriculture, there are very few that particularly, target the impact of cooperatives or any other form of governance in the ASM sector. This paper therefore, synthesizes findings in various pieces of studies conducted in the ASM sector in order to find a common ground for association of cooperatives to wealth creation and poverty reduction. We examine whether or not cooperatives enhance wealth creation among Small Scale and Artisanal Miners using secondary data from published papers.

2. Literature

2.1. Definitions

The Africa Mining Development Council (AMDC) defines Artisanal Mining as that which is characterized by manual labor, or zero to minimal mechanization; zero to minimal geological knowledge; zero or very low start-up capital; is usually unfavorable due to lack of adequate specific policy and regulatory frameworks; is sometimes formal (with precarious mining passes/ cards) but mostly informal; predominantly not organized (although sometimes organized into associations and mining in designated areas); has a complex and disadvantageous market structure (generally getting less than half of the world market price due to interdependency with sponsors, land owners and buyers); highly mobile (they follow the rushes and booms); precarious, unsafe and unhealthy working conditions; marginalized and usually struggling with conflicting land owners and local communities [39].

Cooperatives are autonomous associations of individuals who voluntarily come together to meet common economic, social, and cultural needs [30]. They are democratically controlled enterprises that aim to raise the income and employment prospects of their members [30]. Cooperatives can be found in various industries and sectors, such as agriculture, banking, insurance, fisheries, retail, and utilities [30]. They provide a range of services including information, credit, food, social protection, housing, and job creation [12]. Cooperatives are based on shared values and principles, including voluntary and open membership, democratic member control, member economic participation, autonomy and independence, education and training, cooperation among cooperatives, and concern for the community [27]. The success of cooperatives is evident in their ability to generate profits while adding value to the economy [27]. Therefore, cooperatives are seen as a means to empower individuals and communities, promoting economic development and social responsibility.

2.2. Factors Influencing Participation

In the agriculture sector, cooperative membership is a major force of knowledge and technological transfer, due to not only the spillover effects of the collective use of agricultural technology, but also since collective action facilitates innovation and learning by members of the group [4]. Several studies on agricultural-based cooperatives have identified several factors that affect the participation of households in cooperatives [1, 10, 17, 19, 20, 23, 29, 38]. These can be grouped into household and farm factors (e.g. age of the household, sex, education, household size, land and livestock ownership, access to off-farm income, contacts with extension agents [35]); social capital [32, 36] and networking (e.g. number of years in the village, relatives in leadership positions, and kinship); and locational factors (distance to cooperative office).

Land ownership is an important resource for most

smallholder farmers and previous studies have shown that it has a positive (sometimes negative) effect on the likelihood of farmers to join agricultural cooperatives [15]. The majority of studies however show that participation in cooperatives increases with land ownership [19, 21, 23, 36]. Other studies show a negative relationship between land ownership and the likelihood of cooperative membership [4]. Livestock ownership is usually a proxy for household wealth and this has been shown to increase participation in cooperatives [4, 33]. The extent to which farmers have access to off-farm income also influences the participation in cooperatives [15]. A study by Abebaw and Haile (2013) shows that off-income increased the probability of participating in cooperatives and this is because off-farm income increases the income security of households. Farmers who have regular contacts with extension agents are in a better position to gather useful information regarding the benefits of belonging to a cooperative [1]. The prevailing evidence also suggests that access to credit matters as well. Farmers who have no liquidity constraints are more likely to join cooperatives [33], as they can, for instance, easily pay membership fees.

Social networks are expected to increase the likelihood of cooperative membership because these are usually associated with collective action [1, 23, 33]. Finally, the distance to a cooperative office is a proxy for transaction costs and it is expected that the further away the household is from the cooperative office, the less the likelihood that it would be a member of a cooperative [15]. In the context of developing countries, empirical evidence suggests that cooperative membership is significantly associated with the adoption of agricultural technologies. In Kenya, for instance, [10] show that cooperative membership increased the adoption and intensity of use of improved bananas. Similarly, cooperative membership was highly correlated with the adoption of several innovations in Nigeria, including improved maize varieties, inorganic fertilizers and pesticides [15].

Aside from increasing technology adoption, agricultural cooperative/group membership was also essential in promoting the efficient usage of productive inputs among apple farmers in China and farm performance in the Great Lakes region of Africa [2, 21]. While these are important studies, most of them are based on cross-sectional data. Empirical evidence on the impact of cooperatives on the speed of technology adoption is especially rare. However, the results from the matched difference-in-differences model carried out by [22] in Zambia's Eastern Province, suggest that cooperative membership increases the adoption of inorganic fertilizers and crop rotation by 11 and 24 percentage points, respectively. Furthermore, the results indicate that education, livestock ownership, and access to credit were the important determinants of cooperative membership.

2.3. Factors Influencing the Adoption of Improved Technologies

In the extant adoption literature, there are several empirical studies that have analyzed the factors that affect the adoption of improved agricultural technologies with many of them

applying discrete choice models to identify the relevant factors [8]. In these types of studies, the timing of adoption is not considered. Other studies model technology adoption in a dynamic process where farmers learn about the technology over time and adopt when the expected returns are positive. In these time to adoption studies, duration analysis models have been used to examine the determinants of technology or speed of technology adoption [16].

2.4. Influence of Cooperatives on Wealth and Job Creation and Poverty Reduction

In other sectors other than agriculture, a number of studies have been carried out that suggest a positive relationship between cooperative membership and improved performance. For example, one study that analyzed food cooperatives in the United States focusing on history, current operations, and development models, showed a generalized increase of over \$250 billion in annual revenue of 150 million members of cooperatives in the United States [28]. Another study that analyzed the impact of cooperative enterprises on job creation and economic empowerment showed that Consumer cooperatives can contribute to job creation by providing employment opportunities within the cooperative itself and by supporting the growth of local businesses and the economy [37].

3. Methodology

The methodology adopted was a literature review of published research papers on the cooperative approach

adopted in different countries and how these are linked to wealth creation among Small Scale and Artisanal Miners. The chosen papers contain either empirical or review studies only. The articles containing studies, which are limited to describing any of the ASM organization practice, were excluded to refine the search. A comprehensive search was carried out using SCISPACE together with its extension copilot advanced search for articles published from 2001 to 2021.

The results of the study were achieved by establishing linkages between Cooperatives and ASM performance in terms of: formalization; access to financial capital, appropriate technologies, and markets; improved incomes; and poverty alleviation. The search was limited to English language, and scholarly peer-reviewed papers. Finally, a total of 20 research papers (10 research papers on ASM-based and 10 on other forms sectors) were found to be eligible for review (based on our inclusion and exclusion criteria). These research papers represent the core issues of ASM sector and cooperative practices and implementation in other sectors such as agriculture, food, dairy, banking and non-bank financial lending, etc. Moreover, these studies are mostly considered and referred to by researchers when carrying out further research studies.

4. Results

The major results extracted from these research papers were recorded based on their frequency of occurrence and are listed in Tables 1 and 2.

Table 1. Summary of findings on studies that focused on ASM only.

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
A proposed cooperatives strategy for artisanal and small-scale gold mining sector in Zambia	Webby Banda, Emmanuel K. Chanda (2021)	In this article, a cooperatives strategy for artisanal and small-scale gold mining in Zambia is presented, which exploits a state gold buying program to promote three elements, namely, formalization of the ASGM sector, poverty alleviation in communities hosting gold resources, and macroeconomic stability [34].	- Cooperatives strategy for artisanal and small-scale gold mining - Proposed tax policy for the sector	- Proposed tax policy has lower tax rates - Current fiscal regime imposes high tax burden	- Current tax policy imposes high tax burden. - Proposed tax policy has lower tax rates.	- Formalization of the ASGM sector - Poverty alleviation in communities hosting gold resources	- Formalization of the ASGM sector - Reduction in tax burden for small-scale mining sector
Customary governance of artisanal and small-scale mining in Guinea: Social and environmental practices and outcomes*	Heather Huntington, Kate Marple-Cantrell (2021)	In this paper, the authors present a unique contribution to the literature around customary governance, resource contestations, and land governance for mining communities and the ASM sector in sub-Saharan Africa [11].	Analyzing social and environmental practices and outcomes - Utilizing village level quantitative and qualitative data	- Deeper understanding of customary institutions in ASM - Policy recommendations for promoting complementarity between formal and informal systems	- Customary governance structures prevail in artisanal mining. - Policy recommendations for integrating formal and informal systems.	- Provides a deeper understanding of customary institutions - Identifies how governance affects social and environmental outcomes	- Deeper understanding of customary institutions in ASM - Policy recommendations for promoting complementarity between formal and informal systems
Artisanal and small-scale	Daniele Moretti,	In this paper, the authors argue that, in many developing		- Limited results	- National governments	- National governments and	- Need for broader analysis of illegal

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
mining governance: The 'emerging issue' of 'unregulated mining' in Lao PDR	Nicholas Garrett (2018)	countries, national governments and donor agencies have deliberately designed and implemented mining regulations and policies with the exclusive interests of large-scale mining (LSM) in mind, thus accepting the parallel outcome of illegality of ASM [6].		achieved by individual interventions - Existing regulatory framework implemented in ad hoc manner	prioritize large-scale mining interests. - Broader analysis needed to understand illegal mining impacts.	donor agencies designed mining regulations for large-scale mining. - ASM operators must be Lao PDR citizens.	mining - Attention to complexities in ASM governance regimes
Multinational mining enterprises and artisanal small-scale miners: From confrontation to cooperation	Natalia Yakovleva, Diego Vazquez-Brust (2018)	In this paper, the Salience and Institutional Analysis and Design framework is introduced as a means to analyze the MNE strategies used to address informal miners across different governance levels in the gold mining sector of Ghana and discusses the implications of these strategies for sustainability [25].	- Salience and Institutional Analysis and Design framework - Cooperative strategy with informal miners	Institutional Analysis and Design framework - Identification of cooperative strategy with informal miners as sustainable alternative	- Salience and Institutional Analysis and Design framework used - Cooperative strategy with informal miners is sustainable - Mining cooperatives in Eastern DRC have become instruments of exploitation by economic, political, and customary elites. - The interplay between historical power relations and formal institutions has allowed elites to capture more value.	- Introducing the Salience and Institutional Analysis and Design framework - Identifying a cooperative strategy with informal miners	- Cooperative strategy with informal miners - Sustainable alternative to reliance on the state
Mining cooperatives in Eastern DRC The interplay between historical power relations and formal institutions	Jorden de Haan, Sara Geenen (2016)	In this article, a field study in South Kivu, the authors demonstrate how the interplay between historical power relations and formal institutions has transformed cooperatives into an instrument allowing economic, political and customary elites to continue exercising power and exploiting miners [13].	- Power-laden relational approach to institutions and poverty - Field study in South Kivu	- Cooperatives in Eastern DRC "legalize" exploitation - Mechanisms of exploitation are examined and warned against		- Study on creation and functioning of mining cooperatives - Analysis of historical power relations and exploitation	- Cooperatives in Eastern DRC may perpetuate exploitation. - Mechanisms of exploitation need to be addressed.
Gender and artisanal and small-scale mining: implications for formalization	Doris Buss, Blair Rutherford, Jennifer M. Stewart, Gisèle Eva Côté, Abby Sebina-Zziwa, Richard Kibombo, Jennifer Hinton, Joanne Lebert (2019)	In this article, the authors explore the gendered contexts of artisanal and small-scale mining in sub-Saharan Africa, and trace how women are likely to be excluded from current policy pushes to formally regulate the sector [9].	- Participant observation, survey, focus group discussions, life history interviews - Over-sampling women in the survey sampling strategy	- Women are likely to be excluded from formalizing the artisanal and small-scale mining sector. - Gender needs to be placed at the center of ASM formalization.	- Women are likely to be excluded from formalization initiatives in artisanal and small-scale mining. - Gender should be placed at the center of ASM formalization.	- Qualitative and quantitative research on women's ASM livelihoods - Assessment of how gender organizes women's ASM activities	- Women are likely to be excluded from formalization initiatives in artisanal and small-scale mining. - Gender needs to be placed at the center of ASM formalization.
Mining cooperatives in South Kivu: saviour or extortionist?	Jorden de Haan, Sara Geenen (2015)	In this article, the authors argue that miners' power positions and the distribution of wealth in artisanal mining have not been significantly altered, but that cooperatives are at risk of advancing capture and extortion by the most powerful actors [14].		- Mineworkers' power positions and wealth distribution unchanged - Cooperatives at risk of capture and	- Mining cooperatives do not significantly alter power positions and wealth distribution in	- Mining cooperatives are promoted as a saviour for Congolese artisanal mineworkers. - Cooperatives may	- Mining cooperatives may sustain extortion by powerful actors. - Mineworkers' power positions and wealth distribution remain

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
Voices of artisanal and small-scale mining, visions of the future: Report from the International Conference on Artisanal and Small-scale Mining and Quarrying	Daniel M. Franks, Caroline Ngonze, Lacina Pakoun, Degol Hailu (2020)	In view of the progress, challenges, and still yet to be realized opportunities, delegates from 72 nations assembled in Livingstone, Zambia, 11-13 September 2018, for the International Conference on Artisanal and Small-scale Mining and Quarrying as discussed by the authors [7].		extortion - Summary of the International Conference on Artisanal and Small-scale Mining and Quarrying - Full text of the Mosi-Oa-Tuny a Declaration included	artisanal mining. - Cooperatives are at risk of advancing capture and extortion by powerful actors. - Miners should be at the heart of efforts to transform ASM - Involvement of miners in governance is crucial for resolving sustainable development challenges associated with ASM	sustain extortion by powerful actors. - ASM contributes significantly to livelihoods - ASM has a huge impact on poverty reduction and economic development	unchanged. - Involvement of miners in governance is crucial. - Miners should be empowered to chart their own vision.
Artisanal and small-scale mining: critical approaches to property rights and governance	Christophe Huggins (2016)	In this paper, the authors take a critical look at notions of property to destabilise some of these frameworks and recognize the agency of artisanal miners and local communities within the uneven hierarchies in which they are embedded, and their acknowledgement of the difficulties of state regulation of such a complex set of issues [5].	- Critical examination of property rights frameworks - Recognition of agency of artisanal miners and local communities	- Critical examination of property rights and governance - Recognition of agency of artisanal miners and local communities	- Artisanal and small-scale mining policy frameworks are problematic. - Acknowledgement of difficulties in state regulation.	- Recognition of agency of artisanal miners and local communities - Acknowledgement of difficulties in state regulation	- Recognition of agency of artisanal miners and local communities - Acknowledgement of difficulties in state regulation
The governance of artisanal and small-scale mining in Manica District, Mozambique: implications for women's livelihoods	Blair Rutherford, Laila Manica, Chemane-Chilemba (2020)	The mining sector in Mozambique, as in many parts of Africa, is viewed as a masculine industry; however, when it comes to artisanal and small-scale mining women play a very important role that in m... [3]	- Qualitative research methods - Interviews and focus group discussions	- Women play an important role in artisanal mining. - Governance of mining affects women's livelihoods.	- Women play an important role in artisanal mining. - Governance of mining affects women's livelihoods.	- Women play an important role in artisanal and small-scale mining. - Women's livelihoods are impacted by the governance of mining.	- Recognition of women's important role in mining - Need for gender-inclusive policies and interventions

Table 2. Summary of findings on studies which included other sectors.

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
Co-operation among Co-ops: The Sustainability and Success of the New Food Cooperative Movement in the United States	Sabina Bastias (2013)	The United Nations deemed 2012 the International Year of Cooperatives as discussed by the authors, which was the first year of cooperative literature available to assist new coop founders and to aid in the development of food cooperatives [28].	- Analysis of food cooperatives in the United States - Identifying key variables to classify food cooperatives	- Analysis of food cooperatives in the United States - Identification of key variables to classify food cooperatives	- Food cooperatives in the United States have a long history and have been successful in generating revenue and membership. - Classifying food cooperatives into distinct	- Generated over \$250 billion in annual revenue - 150 million members of cooperatives in the United States	- Identifying key variables to classify food cooperatives - Providing clarity and structural support during initial development stages

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
What is a Cooperative?	Stefano Zamagni, Vera Zamagni (2010)	A cooperative is an autonomous association of persons united voluntarily to meet their common economic, social, social and cultural needs and aspirations through a jointly and democratically controlled enterprise as mentioned in this paper, which can be a source for information, credit, food, social protection, housing, and job creation [30]. A cooperative society is an association of persons who have voluntarily joined together to achieve a common end through the formation of a democratically controlled organization, making equitable contributions to the capital required and accepting a fair share of the risks and benefits of the undertaking, in which the members actively participate [37].			categories can provide clarity and support during development stages. - Cooperatives help raise income and employment prospects - Cooperatives provide various services and utilities	- Raise income and employment prospects - Provide social protection, housing, and job creation	- Cooperatives help raise income and employment prospects - Cooperatives provide vital services and promote education
Cooperatives Enterprises: A Panacea to Job Creation and Economic Empowerment	Y. A. Babalola, R. Tiamiyu (2013)	The fundamental basis of a cooperative is cooperation among its members to generate positive economic and social results as discussed by the authors, and cooperatives are based on moral and ethical values, such as solidarity among partners, equity, democracy, and social responsibility [12].	- Cooperatives as a common workplace - Labour-contracting cooperatives	- Cooperatives can effectively create and maintain self-employment. - Cooperatives must break even to play a social role.	- Cooperative action relieves burden of the state. - Cooperative development policy and legislation are needed.	- Cooperatives create salaried jobs and self-employment opportunities. - Cooperatives provide social security and jobs in the social service sector.	- Cooperative action relieves burden of the state. - Cooperatives require a conducive environment for success.
From Cooperative to Hybrid Organization: Internationalization, Financing and Crisis	Juan José Durán Herrera, Nuria Bajo Davó (2016)	Cooperation as practiced by dairy farmers in marketing milk is an enduring business model that is in full accord with the economic theory of what cooperatives are and what cooperative do as discussed by the authors [18].		- Cooperative organizations are based on moral and ethical values - Cooperatives must add value to the economy to generate profits	- Cooperatives must add value to the economy - Generation of profits is necessary for survival	- Cooperation among members to generate positive results - Adding value to the economy to generate profits	- Cooperatives must generate profits to survive - Cooperatives must add value to the economy
Cooperative Theory, Practice, and Financing: A Dairy Cooperative Case Study	K. Charles Ling (2011)	Cooperative banking is retail and commercial banking organized on a cooperative basis as discussed by the authors, which is defined by the International Cooperative Alliance's Statement on the Cooperative Identity as "an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through jointly owned and democratically controlled enterprise" [40].		- Cooperatives are an effective business model for dairy farmers - Capital financing is not a major issue for dairy cooperatives	- Cooperatives are an effective way for farmers to access markets and enhance market efficiency. - Capital financing is generally not a contentious issue for dairy cooperatives.	- Cooperatives are a third mode of organizing coordination - Dairy cooperatives rely on member-supplied equity capital	- Cooperatives are an effective way for farmers to access markets and enhance market efficiency. - Dairy cooperatives have no issues with capital financing.
Customer Relationship Management: the Enlightening Approach and Attitude of Co-operative Banks in Nashik District	S. J. Jadhav, Manisha N. Sawant, S. B. Pulate (2012)				- Cooperative banks play a vital role in serving common customers. - CRM helps in customer acquisition, growth, and retention.	- Cooperative banks play a vital role in rendering services to common customers. - CRM helps in customer acquisition, growth, and retention.	- Cooperative banks play a vital role in serving common customers. - CRM strategies help in customer acquisition, growth, and retention.

Title	Authors	Paper Summary	Methods Used	Results	Conclusions	Contributions	Practical Implications
Cooperatives: by the people, for the people	Todd Thompson (2007)	The principal of cooperating to better one's life, has been around since man first existed as mentioned in this paper and it did not take early man long to figure out that by cooperating, they would increase their chances in the areas of hunting, fishing, food gathering and protecting one another from wild animals and other dangers [41].			- Cooperating increases chances in hunting, fishing, food gathering. - Cooperating protects from wild animals and dangers.	- Cooperation in hunting, fishing, food gathering, and protection. - Increasing chances and safety through cooperation.	- Increase chances in hunting, fishing, food gathering - Protecting one another from wild animals and dangers
Cooperatives as Information Machines: German Rural Credit Cooperatives,	Timothy W. Guinnane (2016)	In this article, the authors used the business records of several German credit cooperatives to test the hypothesis that real efficiency advantages are at least part of the explanation for their success, and they found that the real efficiency advantage is at least one of the reasons for the success of credit cooperators [31].	- Use of business records of German credit cooperatives - Testing the claim of efficiency advantages in cooperatives	- Real efficiency advantages explain the success of credit cooperatives. - Credit cooperatives were a major financial force in Germany.	- Credit cooperatives in Germany were successful due to their efficiency advantages. - The success of credit cooperatives supports the establishment of microcredit institutions for poor people.	- Credit cooperatives capitalized on superior information. - Credit cooperatives imposed inexpensive but effective sanctions on defaulters.	- Credit cooperatives were successful in Germany - Current discussions on economics of information and microcredit institutions
Cooperative or Uncooperative Cooperatives? Digging into the Process of Cooperation in Food and Agriculture Cooperatives	James Hale, Michael S. Carolan (2018)	The authors found that food and agriculture cooperatives struggle to make decision-making inclusive, may reproduce inequalities through leadership performance, and may unevenly distribute the emotional work necessary to cooperate [42].	- Interviews, focus groups, participant observation - Extended case position, established theoretical cases	- Cooperatives struggle with inclusive decision-making - Emotional work imbalance affects cooperation and participation	- Legal status does not guarantee cooperative relationships. - Decision-making processes can be exclusive.	- Role of socio-cultural boundaries and openings - Interactions that impede or support cooperation	- Legal status does not guarantee cooperative relationships. - Decision-making processes can be exclusive.
Consumer cooperatives: an alternative institutional model for delivery of urban water supply and sanitation services	Fernando Ruiz-Mier, Meike van Ginneken (2006)	In this article, the essential characteristics of consumer cooperatives engaged in the provision of basic services and their applicability as a model for water supply and sanitation service provision in urban areas are discussed [43].	- Overview of cooperatives - Case study of SAGUAPAC cooperative in Bolivia	- Discusses characteristics of consumer cooperatives for service provision - Reviews case of successful urban WSS cooperative in Bolivia	- Cooperatives can be a model for urban water supply and sanitation services - SAGUAPAC in Bolivia is a successful example of a cooperative for WSS services.	- Characteristics of consumer cooperatives in service provision - Case study of successful urban water supply cooperative	- Discusses applicability of consumer cooperatives for water supply - Provides a preliminary assessment of cooperatives as a model for water supply and sanitation services.

5. Discussion of Results

Results in table 1 can be summarized as follows: The economic significance of the Jewel of Africa Mining Company in Zambia's mining sector is not mentioned in the provided information. In the case of Guinea, the paper does not specifically address the efficiency of cooperatives compared to other governance structures for small-scale and artisanal miners. For LAO PDR, the study discusses the issue of illegality and formalization in small-scale mining, particularly in relation to large-scale mining interests. For the

MNE study, the paper suggests that a cooperative strategy with informal miners can be a sustainable alternative to relying on the state for tenure protection. In the case of Eastern DRC, the paper argues that cooperatives in Eastern DRC actually perpetuate exploitation and do not provide an efficient means to generate wealth for small-scale and artisanal miners. The study on gender in ASM argues that Cooperatives have the potential to provide a platform for networking, knowledge sharing, and support for small-scale and artisanal miners, but their effectiveness in generating wealth is not discussed in the paper. For the south Kivu study, the paper suggests that cooperatives in South Kivu province

do not significantly alter power positions or wealth distribution in artisanal mining, and may even enable capture and extortion by powerful actors. Report from the International Conference on Artisanal and Small-scale Mining and Quarrying does not provide specific information on the evaluation of factors affecting the sustainability of artisanal and small-scale mining activities in Tanzania. The study on critical approaches to property rights and governance concludes that Government policy and support can have both positive and negative effects on small scale and artisanal miners, as it can either provide them with necessary resources and protection or stigmatize and discipline them. The Manica District of Mozambique study does not specifically address the efficiency of cooperatives compared to other governance structures for small-scale and artisanal miners.

Results in table 2 are summarized as follows: Cooperatives are autonomous associations of individuals who voluntarily come together to meet common economic, social, and cultural needs. They are democratically controlled enterprises that aim to raise the income and employment prospects of their members. Cooperatives can be found in various industries and sectors, such as agriculture, banking, insurance, fisheries, retail, and utilities. They provide a range of services including information, credit, food, social protection, housing, and job creation. Cooperatives are based on shared values and principles, including voluntary and open membership, democratic member control, member economic participation, autonomy and independence, education and training, cooperation among cooperatives, and concern for the community. The success of cooperatives is evident in their ability to generate profits while adding value to the economy. Cooperatives are seen as a means to empower individuals and communities, promoting economic development and social responsibility.

Triangulating results in tables 1 and 2 suggests there is a case for positive and negative impact of cooperatives on wealth creation in the ASM sector. However, there is need for more empirical studies in the ASM sector on the impact of cooperatives. Further, even studies in other sectors that have shown positive results, there has been no case to show the impact of the phenomenon of the “Tragedy of the Commons” in the cooperatives and how it can be mitigated.

6. Conclusion and Policy Recommendations

The results in this study show that there is a case for positive and negative impact of cooperatives on wealth creation and poverty reduction in the ASM sector. However, there is need for more empirical studies in the ASM sector on the impact of cooperatives. Further, even studies conducted in other sectors that have shown positive results, there has been no attempt to show the impact of the phenomenon of the “Tragedy of the Commons” in the cooperatives and how it can be mitigated.

On the basis of findings in this study, the following policy

recommendations have been made: (1) There is need for formalization of the ASM sector, reduction in tax burden for small-scale mining sector, and deeper understanding of customary institutions in ASM; (2) There is need for policy recommendations for promoting complementarity between formal and informal systems, broader analysis of illegal mining, and attention to complexities in ASM governance regimes; (3) There is need for cooperative strategy with informal miners, sustainable alternative to reliance on the state, and mechanisms of exploitation need to be addressed; (4) Gender needs to be placed at the center of ASM formalization, involvement of miners in governance, and miners should be empowered to chart their own vision; and (5) There is need for recognition of agency of artisanal miners and local communities, acknowledgement of difficulties in state regulation, recognition of women's important role in mining, and the need for gender-inclusive policies and interventions.

7. Recommendations for Future Studies

Through this study, a number of interesting results were unraveled that require further research. One particular area relates to the need to conduct more empirical studies about cooperatives and wealth creation in the ASM sector and association between them, and a system's overall performance. Second, there is need to carry out further research on the effects of the “Tragedy of the Commons” phenomenon in ASM cooperatives and how such can be mitigated,

Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Author Contributions

Conceptualization: Richard Musukwa; Frank Mukwilima

Methodology: Richard Musukwa, Frank Mukwilima

Data curation: Frank Mukwilima

Formal analysis: Frank Mukwilima

Investigation: Richard Musukwa; Frank Mukwilima

Writing – original draft: Frank Mukwilima

Visualization: Frank Mukwilima

Project administration: Richard Musukwa

Software: Frank Mukwilima

Resources: Richard Musukwa

Review and editing: Professor E. Kazonga; Dr B. Mapeto; Richard Musukwa; Frank Mukwilima;

Supervision: Profesor E. Kazonga; Dr B. Mapeto

Funding acquisition: Richard Musukwa

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The views and opinions expressed in this paper are entirely those of the authors and do not necessarily represent the official policy or position of any agency or organization to which each of the authors are affiliated to.

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