EVALUATION OF THE EFFECTIVENESS OF SKILLS TRAINING AND PROPER MINING METHODS ON SMALL SCALE MINING TO IMPROVE GOLD PRODUCTION. A CASE STUDY OF INSIZA AND UMZINGWANE DISTRICTS IN MATABELELAND SOUTH PROVINCE, ZIMBABWE, (2010-2021.

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ABSTRACT

The study sought to evaluate the effectiveness of skills training and proper mining methods to improve gold productivity in the two districts of Insiza and Umzingwane, Matabeleland South province in Zimbabwe. The objective was to evaluate the impact of managerial and technical skills in safe and efficient mining, to examine the possible ways of pooling the resource to ensure sustainability of the mining sector, and assessing the effect of funding of mining operations and to determine whether the legal framework supports small scale mining sector. In order to achieve that, the study used the triangulation research design of employing both the quantitative and qualitative methods to collect data using questionnaires and interviews. The targeted respondents were selected by convenience and purposive sampling. There were major findings that included the importance of skills training, proper mining methods and funding for operations as factors influencing the increase in gold production. The research reveals the change in mindset of the female who now venture into the once male dominated mining areas. It was concluded that with the backing of the legal framework, funding of the small scale mining sector and provision of proper skills training, the sector will go a long way in contributing revenue to the national economy. It was recommended that the government and donor community should work together and have a participatory approach in carrying out the mining project of small scale mining to avoid duplication of duties and conflicting of interests.

Keywords: skills training, mining scale, sustainability, gold productivity, framework

New terms and Abbreviations.

Amalgam: It is an alloy of mercury with another metal that is solid or liquid.

Greenstone belt: It is a zone of variably metamorhised mafic to ultrmafic volcanic sequences with associated sedimentary rocks that occur within Archean and Proterozoic cratons between granite and gneiss

bodies. The name comes from the green hue imparted by the colour of the metamorphic minerals within the mafic rocks.

Great Dyke: It is a linear geological feature that trends nearly north-south through the centre of Zimbabwe passing just to the west of the capital, Harare. It consists of a band of short, narrow ridges and hills spanning for approximately 550 kilometres.

Ore: It is a metal bearing mineral rock or a native metal that can be mined at a profit.

Sluice box: It is a long trough with grooves on the bottom into which water is directed to separate gold from gravel or sand.

CASM: Community and Small Scale Mining.

EMA: Environmental Management Agency

ITG/Practical Action: International Technology Group.

SNV: Stichting Nederlandse Vrijwilligers (Netherlands Development Organisation.

1.1 Background of the study.

Historically, in pre independence Zimbabwe, mining has been the preserve of the white minority and most black people were denied the privilege to venture into the mining industry as players but only as workers. With the attainment of independence in April 1980, the mining industry opened up to the black majority who had attained the age of eighteen and had the interest of venturing in mining.

The research will focus on the formal (legal) small scale mining sector in the selected districts of Insiza and Umzingwane of Matabeleland South Province in Zimbabwe from January 2010 to April 2016. The formal small scale miners are those who register their mining claims with the Ministry of Mines and Mining Development in accordance with the provisions of the Mines and Minerals Act (Chapter 21:05) (1996). The reason for focusing on legal small scale miners is that the informal miners are not easy to locate because of their migrant nature of mining as they do not mine at one place. They only move around the districts looking for areas with high grade gold ore. Therefore, it is difficult to locate them and they normally do not want to be interviewed or the people to understand their operations as they always have running battles with the law enforcement agents.

However, Dreschler (2001) argues that mining has remained a prerogative of men because of the cultural and traditional beliefs that prevented women and the youth from effectively engaging in the mining business. Women and youths have only been benefitting indirectly through their male members of the families. For the past decade, Zimbabwe's small scale mining sector experienced a shift of the mindset with women and youth participating effectively in the gold production as a means of livelihood. Economically, the small scale mining rises in Zimbabwe's districts of Insiza and Umzingwane in Matabeleland South because they lie in the greenstone belt along the Great Dyke that embodies a lot of minerals, namely, gold, platinum group of metals, chrome, copper, iron, to name but a few. The areas lie in the arid region of the country that does not support agriculture, leaving the people to look for other alternatives to sustain their lives.

Maponga, et al (2002) state that gold mining is the process of extracting gold or gold ore from the ground and there are several techniques and processes by which gold may be extracted from the earth. Gold panning is the commonly used technique but it is not commercially viable for extracting gold. There are new and advanced methods of gold extraction and processing such as cyanidation, carbon elution and hammer milling which are commercially viable but need skills training and knowledge. Most of the small scale

miners lack the technical mining knowledge hence they are not able to fully enjoy the actual value of their labour in the mining business when using rudimentary methods.

They further explain that small scale gold mining can significantly alter the natural environment thereby causing deforestation, loss of aquatic, human and wildlife. There is also a high risk of such mining ventures as seen in the collapsing of mines due to improper mining methods. It is at this juncture that the study has found it imperative to explore ways of curbing further environmental degradation and mine fatalities by unearthing the reason why small scale miners deliberately operate outside the legal framework by avoiding interacting effectively with law enforcement agents. It is also important to investigate why they shun the government efforts to train them in skills, equip them with machinery and provide funding through the Mining Industry Loan Fund and private donors.

Figure 1.1: Picture showing gold panning activity

Source: https:/www.stivosouthafrca.wordpress.com. (29/06/2016)

Chibisa (2014) explains that in the districts of Insiza and Umzingwane, many large scale mines have either closed down or simply abandoned their mines due to the economic reforms and indigenisation laws being implemented by the government. The government, however, has recognized the potential of small scale gold mining to sustain livelihoods and contribute to the national economy as evidenced by the fact that they contribute sixty percent of the gold produced in Zimbabwe.

Takavarasha (2012) pointed out that efforts are being made to promote small scale gold mining to avail mining service centres in the eight provinces of Zimbabwe to equip miners with skills and knowledge on proper mining methods. He lamented on the challenges being encountered in this effort to bring the small scale miners into the mainstream, especially translating the number of registered mines into operational mines is an extremely complex matter. Many people register their claims for speculative purposes such as selling of claims to potential investors or covering up for their illegal gold dealings on the parallel market. Some formal small scale miners lack the skills and proper knowledge on how to productively utilise their mining claims in order to sustain their livelihoods. It was further explained that some miners practice

seasonal mining instead of mining throughout the year due to undercapitalisation and underfunding of the operations. The research will try to uncover the underlying factors that cause the small scale miners not to improve their productivity even if their mining claims geologically are viable.

He elaborated on how small scale mining in Insiza and Umzingwane districts had sustained many lives as it has created a lot of employment. Many people who had lost their jobs due to the prevailing economic hardships and the youths who never got the chance to be formally employed find themselves resorting to small scale mining for survival. As stated in the introduction that the districts lie in the arid region of the country where agriculture cannot sustain livelihoods due to erratic rainfall patterns, gold mining is the major activity. Ironically, the small scale mining rises according to the problems within the large scale mining industry. Whenever large mining companies are forced to close down due to viability problems or policy interventions, the retrenched miners find themselves in small scale mining because it is the industry they know best.

1.2 Objectives of the study.

The objectives of this research paper are to:

- evaluate the effectiveness of skills training and education on proper mining methods on small scale miners to improve gold productivity.
- investigate whether the small scale miners understand and implement their roles in economic empowerment in their livelihoods.
- examine the possibilities of pooling of resources through networking and alliance building to undertake sustainable mining.
- recommend small scale miners to donors and large mining companies for support through funding and skills training.

1.3 Research questions.

The research questions of the study of the study are:

- Are the environmental and human health problems of small scale miners caused by lack of knowledge of risks on the part of miners?
- What is the role and impact of culture and traditional beliefs in allowing women and youth to participate in skills training and mining in these communities as compared to other nations?
- Are the mining associations, such as Zimbabwe Miners' Federation, Women in Mining and Youth in mining, making their members aware of their need of skills training and knowledge?
- What gaps, in policy interventions, have been identified by government to assist the small scale miners in increasing gold productivity?
- Was there any wide consultation of the stakeholders to identify the skills gap that need to be addressed?

1.4 Delimitations

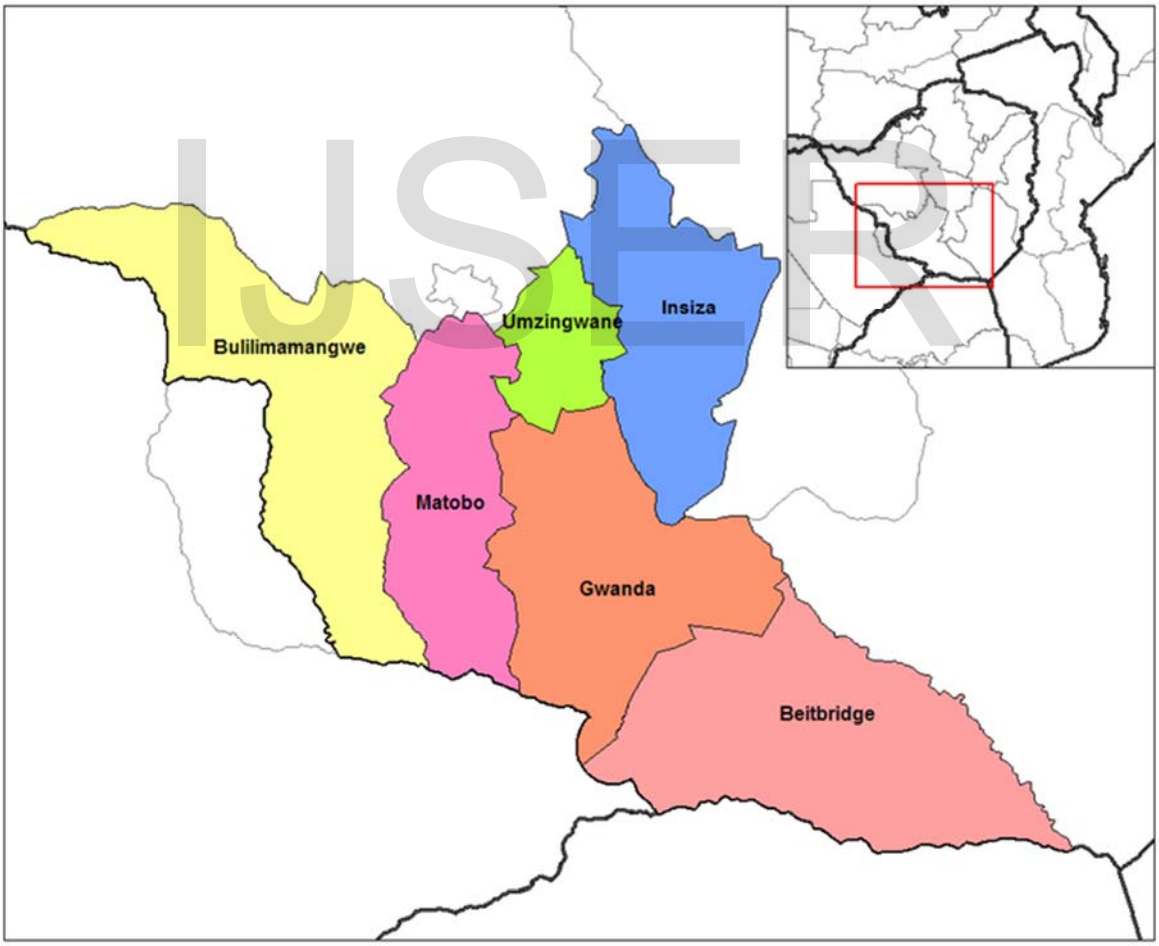
In the study, data will be gathered from the Insiza and Umzingwane districts of Matabeleland South Province in Zimbabwe. Matabeleland South province is on the south western part of the country and has seven districts with a total population of 683 893 people. Insiza is one of the selected districts for the research in Matabeleland South Province. It lies approximately 65km on the south-east of Bulawayo, borders Gwanda district to the south, Zvishavane to the east and Umzingwane district to the west. It is a

second order administrative division with a population of 100 333 people. The other selected district for the study is Umzingwane and it lies approximately 25 km south south-east of Bulawayo, the second largest city of Zimbabwe. The district has an estimated population of 62 990 (Zimbabwe Population Census, (2012). The two districts are in the agro-region 4 and 5 of the country that receives little and erratic rainfall and therefore do not rely on agriculture only but also on mining activities to sustain lives.

According to Phiri (2011), the people who are mostly involved in small scale mining are mainly young to middle aged ranging from the ages of 15 to 55 years because of the nature of the hard work that need a lot of energy. The bulk of the miners has little schooling and therefore lacks mining skills and appreciation of a healthy environment.

Secondary data will be collected from Bulawayo because that is where the government offices are housed at Mhlahlandlela building at the corner of Basch street and Tenth Avenue. The associations offices are also found in the city centre of Bulawayo and it will be easy to access them because the researcher resides in the same city.

Figure 1.2: Map showing Insiza and Umzingwane Districts of Matabeleland South Province



Source: Google Map (25/03/2022)

2.0 Literature Review

Defining skills training.

In the business dictionary, skill training is defined as ability and capacities acquired through deliberate, systematic and sustained effort to smoothly and adoptively carry out complex activities or job functions involving cognitive skills, technical skills and interpersonal skills. In the Merriam- Webster's Learner's dictionary 1843), it is simplified as a process by which someone is taught the skills that are needed for an art, profession or job.

However, it is further defined better by Bishop, et al, (2015) as structured competency based activity usually with a set curriculum or learning plan that teaches the learner job specific skills needed to perform actual job tasks and functions required by a particular job. Job specific skills may be provided through individual, group training or the job training. In support, Liimatainen (2002) defines skills training as the acquisition of occupational or job related skills.

The other authors separate technical skills and soft skills when defining the skills needed in an organisation. Morrison (2011) defines the soft skills as personal attributes and interpersonal abilities. However, Rouse (2016) defines soft skills as personal attribute that indicate a high level of emotional intelligence.

Osterman (2015) attempts to generalise on the above definitions by suggesting that an amount of training should be related to the level of skill required in the job as an organisation has various departments that contribute to the smooth operation of the production.

It is imperative to explain what the skills training entails in order to fully understand its effectiveness in improving gold productivity in the mining industry. Kerka (2006), explains that skills such as punctuality and interpersonal communication demonstrate how raising basic cognitive skills could have an impact on employment outcomes and earnings because changes in the nature of work now favour high skilled workers. Job training should give the workers the skills employers want in today's labour market as well as prepare them to learn new job skills throughout their working life. Employers can define their skills needs to help structure training and they can offer opportunities for their workers to practice their skills on the job training.

2.3 The importance of skills training.

As a background to the importance of skills training, Somavia (2011) demonstrates that a policy framework is the cornerstone for developing a suitably skilled workforce. Good quality primary and secondary education, complemented by relevant vocational training and skills development opportunities prepare future generations for their productive lives. That endows them with the core skills that enable them to continue learning. A good skills development system will be able to anticipate skill needs, engage employees in decision making and make training accessible to all sectors of the society. He explains the importance of skills training in coping with the change that happens so fast in the world, driven by innovation and developments in technology and markets. In order to keep up with the pace of change, active participation of both employers and employees in continuous vocational education and training is essential.

In his assessment of the importance of skills training, Somavia (2011) believes that innovations and technologies are powerful drivers of economic growth as they translate into investment in workforce and entrepreneurial skills which in turn lead to higher productivity. Higher productivity enables an organisation to remain competitive.

In support, Liimatainen (2002) states that the development of relevant skills is a major instrument for improved productivity and better working conditions as it is essential for the survival and growth of the

economic sectors. Appropriate approaches to training in every sector of the economy have to be designed differently according to the situation of each particular group of workers in a particular region.

He emphasises that the core issue in providing relevant training is to identify what the real training needs are and that it should be market driven. In this situation, the importance of skills training is that it must respond to clients' demands rather than the demands of the donors, non-governmental organisations (NGOs) or other suppliers of training. Skills training must also be relevant to the clients and should depart from the conventional formal training design in which it is planned and developed externally and then transmitted to the participants. It should rather stem from the local strengths and long established means of skills transmission that is subject to the socio-cultural mechanisms in the workplace.

Chopra (2015) agrees with the above view that in an ever changing and fast paced corporate world, skills training and development is an indispensable function to fill the skills gap that is created by innovations and advances in technology. Training presents a prime opportunity to expand the knowledge base of all employees, but many employers find the development opportunities expensive. Training and development provides the company as a whole with benefits that make the cost and time a worthwhile investment by improving performance, employee satisfaction, increase productivity and consistency. The levels of the impact of skills training provision is highly dependent on the approach to training type of training methods and the targeted group in order to have a link between training and positive outcomes.

Although Frost (2015) agrees with the above view, she emphasises that normally most employees have some weaknesses in their workplace. Skills training allow employees to acquire new skills, sharpen existing ones, perform better and increase productivity. Skills Training is particularly important for employees and it can be conducted by someone within the company and should serve as a platform to get new employees up to speed with the processes of the company and address any skill gaps. Every individual has some shortcomings and training and development helps employees iron them out by strengthen the skills that employee needs to improve. It helps reduce any weak links within the company and create an overall knowledgeable staff.

Frost (2015) further states that an employee who receives the necessary skill training is in a better position to perform the required job. The training also builds the employee's confidence because he/she has a stronger understanding of the mining industry and the responsibilities of the job. This confidence may push the employee to perform even better and think of new ideas that help them excel. Continuous training also keeps employees abreast with the changing technologies in the mining industry and help the small scale miners become a strong competitor in the industry.

Priestal, et al, (1993) is also of the view that a structured training and development programme ensures that employees have a consistent experience and background knowledge. The consistency is particularly relevant for the company's basic policies and procedures. All employees need to be aware of the expectations and procedures within the company. These include safety, discrimination and administrative tasks. Putting all employees through regular training ensures that all employees at least have exposure to information.

Priester, et al (1993) agree with Frost on the need to expose miners to different forms of training although they explain further on the specific areas of training in essential skills that enable them to improve their working conditions. They point out that the small scale miners need training in exploration activities, such as analysis, deposit geology and mineralogy. They have to be trained in organisation and implementation of exploitation activities, such as safety measures, mining operations mechanisation and operation of machines. Lastly, they need training in handling and treatment of chemicals which are hazardous to health and the environment. The goal of these innovations is to assist small scale miners in improving operational success by increasing mine output, safety and environmental impact.

Chopra (2015) asserts that a company that invests in training and development generally tends to have satisfied employees. However, the exercise has to be relevant to the employees and one from which they can learn and take back some knowledge. Employees with access to training and development programmes have advantage over employees in companies who are left to seek out training opportunities on their own. The investment in training that a company makes shows that employees are valued and appreciated and that makes them feel more satisfied toward their jobs. Employees who have attended the right training need lesser supervision and guidance as the start utilising the skills and knowledge they would have acquired. Increase in productivity is not only dependant on employees but also on the technology they use. Training goes a long way in getting employees up to date with new technology, using existing ones better and discarding the outdated ones.

The above view seems to dovetail into the example given by Russell (2014) when she said that the South African mining industry recognises the need to invest in its skills base through training and development. The provision of training and development enhances employee safety and productivity and that is why the South African mining sector aims at training the women and the historically disadvantaged people in the society.

Whilst Saini (2014) agrees with Russell (2015) that training improves the competencies, she points out that a well-trained person goes higher in having esteem and derives better job satisfaction from the work. As the skills become obsolete due to the emergence of new technology, employees need to update their skills to cope with the new challenges. She is also of the view that training and development should not be viewed only as a performance matter but also as a base to build new knowledge and skills for innovation. Organisations should invest in the best possible solutions for their staff's career paths.

However, Torch (2013) has a different approach to the importance of skills training when he explains that hard skills should be combined with soft skills training. According to him, soft skills simply relate to a collection of personal traits, positive attributes and communication abilities that enhance an employee's relationship and performance on the job. He states that for a long time, the performance of soft skills has been undervalued as companies assume that people know how to behave on the job. Recent years have seen that business has become less dictatorial and more social and the value of soft skills in organisations is growing with its training becoming essential. These are communication skills to enable the workers to articulate when speaking and have the ability to listen. Adaptability skills enable employees to have a good attitude towards change when it is implemented in an organisation. Lastly, the skill of teamwork helps the workers to work well in a group setting, demonstrating cooperation and compromise.

2.4 **Proper mining methods and their importance**

Hudson (1999) links the view on the importance of skills training with the education on proper mining methods to improve gold productivity. The two aspects should never operate in isolation but should be done together and equal importance is attached to them. He defines education as activities aimed at acquiring general knowledge, attitudes and values. Investing in expanding access to basic education is crucial as it affects occupational success of workers to a greater extent than usually realised.

He argues that the other vital aspect of skills training and education in proper mining methods is that the miners become knowledgeable of the modern mining operations and they become aware of the environmental concerns caused by mining such as physical disturbance to the landscape, degradation of surface and ground water quality and air pollution. Miners would strive to mitigate these environmental consequences of extracting gold as they realise that the effective mitigation lies in implementing scientific and technological advances that prevent or control undesired environmental impacts. Another consideration at some mine sites is the ground sinking. Reclamation and safety mitigation methods that address hazards can be taught such as installing warning signs and fencing off dangerous areas.

To understand modern mining practices, it is useful to trace the evolution of mining technology. It is chronologically explained in the U.S Geological Survey Mineral Yearbook (1995) that in the Old Stone Age, small scale miners extracted gold from loose stones by using crude methods of chipping the flint and then shaping them into jewellery. In the New Stone Age, people then progressed to underground mining, using methods of ground control, ventilation, lighting and rock breakage and hoisting. They soon devised a revolutionary technology called fire setting, whereby they first heated the rock to expand it and then doused it with cold water to contract and break it. This was one of the first great advances in the science of rock breakage and had a greater impact than any other discovery until the dynamite was invented by Alfred Nobel in 1867. The soaring demand for gold came during the era of the Industrial Revolution and there was an improvement in mining technology, especially in scientific concepts and mechanisation that have continued to this day. This ushered the era of mechanised mining hence the need for continuous skills training to operate the new machinery and increase productivity.

According to Hamrin (1980), it is quite difficult to define mining methods in a single sentence but it can be explained how the miners extract the gold from the earth's surface or underground. Most scholars have tried to explain the main methods of mining but their explanations have been narrowed down to two main methods of mining which are surface and underground mining. The term mining is used in its broadest context as encompassing the extracting of any naturally occurring mineral substances, solid, liquid and gas from the earth. He points out that once an ore body has been probed and outlined and sufficient information has been collected to warrant further analysis, the important process of selecting the most appropriate method or methods of mining can begin.

Sharing the same view is Aryee (2003) who explains that mining methods employed by small scale miners of gold vary according to the type of deposit and its location. Surface mining involves the method of open cast mining which is usually employed to exploit a near surface gold deposit and has a low operating cost and good safety conditions. The mining excavations are entirely open and on the surface.

The above mining method is supported in the Ministry of Mines Publication No 6 (2010) where it is stated that the open cast mining method is suitable for extraction of ore occurring in large bodies. The document explains that the method consists of removal of waste material overlying and surrounding an ore body so that the ore is exposed and then easily extracted. The open cast method is preferred because it is inherently safer than any other method in so far as work does not take place beneath an overhanging rock mass. The other advantages highlighted are that the ventilation problem is reduced to dust suppression at the points where work would be in progress and supervision is effective thereby reducing handing costs.

According to Weiser (2003), if the excavations consist of openings for human entry to below the earth's surface, it is called underground mining. Underground methods involve shaft mining that has to be supported by pillars to avoid caving in during drilling and hauling of the ore to the surface. The details of the procedure, layout and equipment used in the mine distinguish the mining method. This method consists of establishing drives at a predetermined interval to allow the ground to remain strong and supported. Ventilation holes are necessary at this juncture to allow free circulation of air to minimise gas choking. One of the biggest challenges facing gold miners today is how they can increase productivity without compromising safety or increasing costs.

Aryee (2003) also explains that with the blanket ban on alluvial gold mining along rivers and river beds, majority of small scale miners are now using hard rock mining techniques of sinking holes to intercept the reefs and then mine along the strike of that reef. Where such reefs are weathered, they use chisels and hammers to break the rock. In cases of hard rock, explosives are commonly used to blast and break the rock. For small scale miners to know and select the correct method of mining, they should undergo some form of education to equip them with that knowledge of rock formation or geological occurrence of gold ore.

It is the processing methods that Aryee (2003) states that proper training is required in order to recover more gold. He points out that small scale miners need training and education on handling the chemicals to minimise their impact on the environment. The small scale miners commonly use the sluicing method of processing the gold. This is a method whereby the crushed ore is put in a sluice box and mercury is added to form a gold amalgam which is then heated to separate the gold. Although the application of mercury amalgamation is a simple and inexpensive way to extract gold it poses environmental and health risks arising from the use of mercury in gold extraction. It is suggested that although retorts can capture 95% of the emissions and enable mercury to be re-used, many miners should have access to education and training on the proper use of mercury and its storage.

Ian Scoones (2015) strongly supports the idea of reducing the use of mercury in the extraction of gold when he pointed out that its use has caused a lot environmental disturbances and is a danger to humanity. He further highlighted that the recent work had shown that over 70% of the small scale miners have some level of mercury poisoning. Key lessons learnt from the past initiatives highlight that education and training programmes to reduce the use of mercury and address environmental risks need to be accompanied by long term measures to empower mine workers to access and adopt enhanced technologies.

Figure 2.1: Picture showing gold processing plant.

Source: https:/www.miningzimbabwe.com. (25/03/2021).

Persaud and Telmer (2014) have gone at length to discuss the Mercury Watch Project which they say was used to develop the Minamata Convention on mercury. They argue that the information gathered show that mercury release to the environment from small scale gold mining surpasses coal. The main problem that the Mercury Watch project is meant to address is the lack of global strategy, knowledge base and release of mercury. The project's objective is to increase awareness around the topic of mercury use by facilitating specific research and training exercises in several countries, Zimbabwe included. They further point out that although the project is ongoing, increased efforts and resources need to be allocated to carrying out in-depth research on country specific mining small scale mining sectors.

3.0 Research Methodology

In this research study, a triangulation research design was used to collect the information. (Kennedy, 2009) who describes triangulation as a means of using more than one method to collect data on the same topic. The purpose of a descriptive design was to provide the perceptions and views of the respondents about the phenomenon studied. The study attempted to identify and describe factors that contributed to the evaluation of the skills training and education on proper methods of mining to increase gold productivity.

Convenience sampling was used to select the readily available respondents without dwelling much on the categories of the members of the population. In this study, for example, only small scale miners were selected because they were accessible to the researcher from the various groups of men, women and youths who were productively mining gold. The other reason was that they are the only group that is able to give credible responses that can assist the researcher to effectively arrive at the proper conclusion. The miners who were not operating their mines were not selected because they did not meet the criteria as it was difficult to evaluate their gold production figures or mining methods they are using to extract the gold. In addition, judgement or purposive sampling was used to select the respondents who were accessible to the researcher. The researcher had prior knowledge of some of the respondents who were seriously operating their mines and producing gold for disposal at Fidelity Printers and Refineries.

The questionnaire was used because of its ability to accommodate a large sample size of small scale miners, thereby saving the resources in actually interviewing all individuals to get their input. Interviews were used for the few selected representatives of the associations to gather information which was not privy to their members or when the researcher needed clarification on the information that could not be captured by the questionnaire.

4.0 Findings of the study

The results obtained from the study show that the small scale mining industry is mainly dominated by males with 68.4 % of respondents being males and 31.6 % being females. The reason may be the cultural aspect where mining is traditionally a male preserve that is mining has been a male dominated industry from the pre-colonial era. Females have also shunned mining because of the hard work involved in the extraction of the precious mineral and therefore preferred to stay at home to prepare food for their male counterparts and look after the children. It is only in recent years that the gender issue has been brought to the fore in order to change the mindset and more female participants are venturing into once male dominated mining sector. The other reason that supports the one above could be that females are now participating in mining because most of their male counterparts have migrated to either South Africa or Botswana to seek for better job opportunities as the general trend in most districts of Matabeleland South province in Zimbabwe. Most families are headed by females who are left with no other alternatives but to venture into mining because since agriculture cannot sustain livelihoods.

More so, the age that dominates the small scale mining at Insiza and Umzingwane district is 18-25yrs contributing 36.8% of the total number of respondents followed by 36-45yrs and 26-35yrs both with 23.7% and the least represented age groups are the 46-55yrs and 56yrs+ both with 7.9%. The higher percentages of respondents belong to the 18-25years, 26-35years and 36-45years respectively, the reason could be a result of the nature of the hard work in mining that it needs strong and energetic age groups. Another reason could be that of the prevailing economic challenges in Zimbabwe since 2008. Most of the industries closed down, including mines, and the unemployed resorted to mining to sustain their lives.

Most of the youths have never been formally employed since they left school and the small scale mining sector is readily available to absorb them with or without pre-skills training. The trend could change when the economic situation in the country improves when the other sectors of the economy are resuscitated to employ more workers. Most of the respondents were registered miners constituting 44.7% of the total amount of respondents. Mine workers constituted 26.3% of the total amount of respondent and the

remaining 28.9% however did not specify their occupation. Table 4.3 shows the occupations for the respondents.
From these respondents 44.7%, come from the local community where as on the other hand 55.3% come from other places to settle in the area under study in search of gold reefs for mining.

The explanation for the highest percentage being registered miners could be a result of the fact that unregistered miners and workers do not want to answer questions from strangers for unknown reasons. It could be fear of victimisation by their employers in the event that they reveal information privy to the mine owner or fear of being on the wrong side of the law.

The other reason could be that of the literacy levels as most mine workers are not well educated to be able to understand and complete questionnaires. They prefer to shy away from the researchers in order to conceal their illiteracy.

On the reason why the percentage is higher for those who come from outside the communities they are mining, it may be caused by the ability to finance the mining operations. Since mining is a financial demanding venture, most people cannot afford to fund the operations, hence the need to seek outside help to sponsor them. Also the mining law does not restrict the people from other areas to prospect and mine anywhere in the country where they discover gold deposits. Any person can register a mining claim anywhere in the country as long as they prove that they have found mineral deposits. In this case, people prospect along the greenstone belt and the Great Dyke that cut across the selected districts of Matabeleland South province.

An evaluation of the managerial and technical skills of small scale miners in order to promote safe and efficient mining

The results obtained from the study reveals that most of the small scale miners that hold managerial positions lack the mining technical skills. This could be a result of fact that they are just owners of the mines but most of them have never attended any skills training. The respondents who attended the skills training courses were only 23.7% as compared to the 76.3% who had not attended any skills training programme. It is from these respondents that the research is going derives its findings on the effectiveness of skills training to see whether those who have received the training have improved on gold production as compared to those who did not train at all. It is the same respondents who received the training that show the knowledge for safe methods of mining to increase gold productivity.

The results support the notion that only a few miners who have access to information and can afford to pay the required fees attend the training courses. The 76.3% of the respondents who did not attend the training might not be aware of such programs or it could be as a result of inadequate or no training institutions in the province.

Figure 4.1 shows percentages of respondents that attended skills training and those that did not.

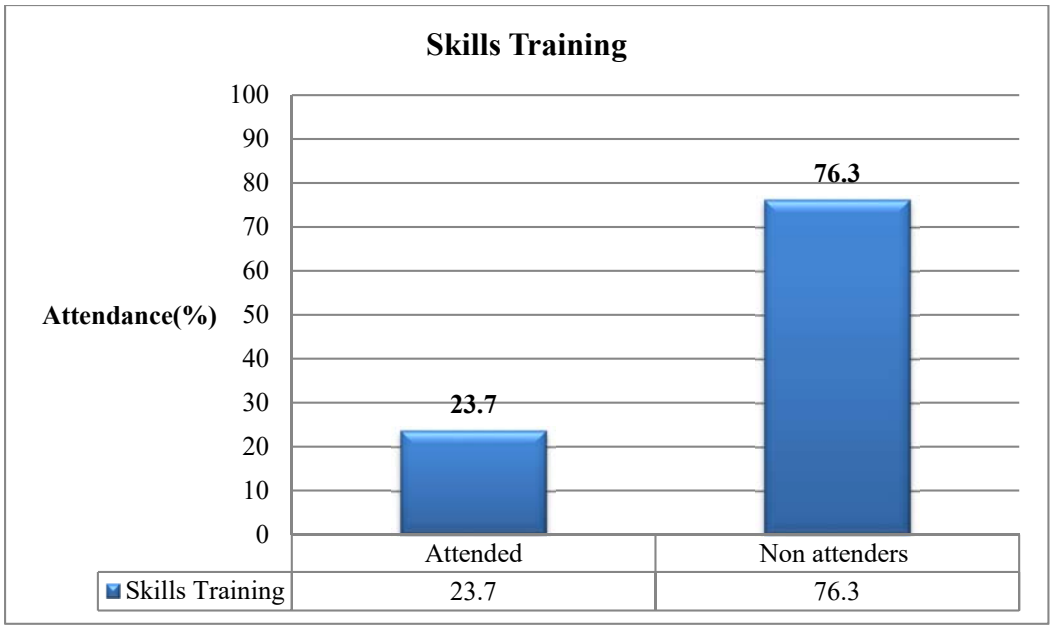


Figure 4.1: Percentage of respondents that attended skills training and those that did not.

The result on Table 4.1 shows that most miners have not attended the skills training courses not because they are not willing to do so but for several reasons that range from lack of knowledge of the existence of any courses offered the exorbitant training fees and the lack of consultation by those who offer the training to ascertain whether they address the training needs of the recipients.
The respondents who resided in urban areas are the once who had access to the training because they were aware of the skills training offered at the Zimbabwe School of Mines and they could afford the fees and accommodation.

However, when asked whether they want to attend a skills training, 81% responded positively though they mentioned the issue of training fees, on the other hand 19% responded negatively highlighting the insignificancy of such trainings. The results show that respondents realize the importance of skills training and use of proper mining to enhance their gold production. The results can be diagrammatically presented as in figure 4 below:

The training analysis of respondents.

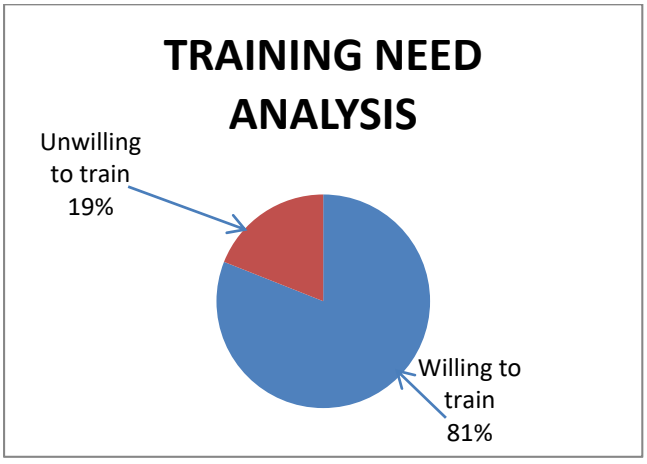


Figure 4.2: Percentages of respondents who are either willing or unwilling to train.

The results also show that most of the small scale miners do not belong to any mining association. Only 32% of the miners belonged to a mining association but the other 68% of the respondents did not belong to any mining association this is shown in the Figure 4.2.

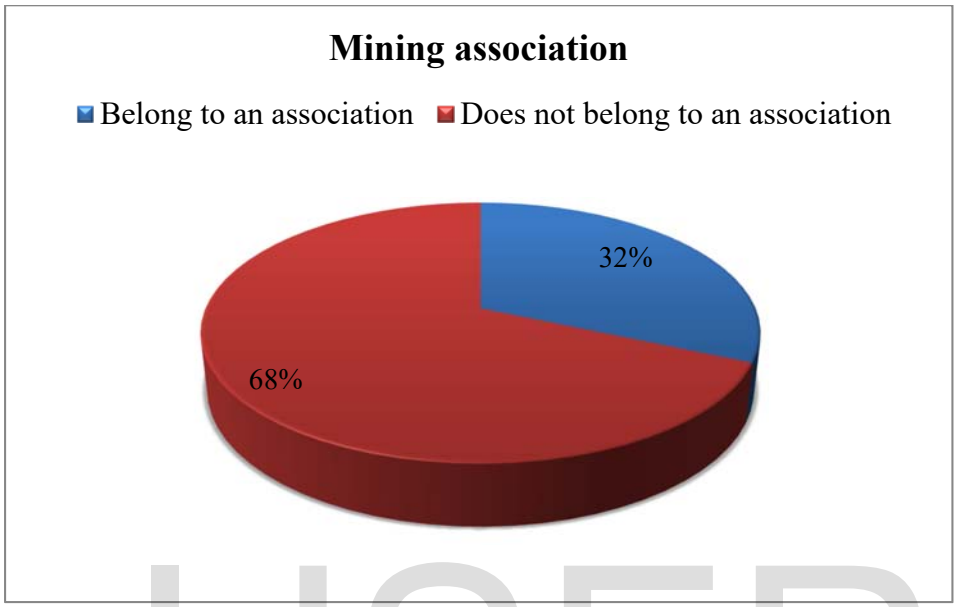


Fig 4.3: Percentages of respondents belonging to an association and those not belonging to any association.

The above result shows that the miners are not joining the associations for several reasons. It could be the reason that most miners are unwilling to pay subscriptions to the associations that do not have anything to offer them in return. The leaders of the associations do not disseminate adequate information on the benefits of belonging to an association and most miners have not seen or experienced any since the formation of these association. Most miners may regard associations as a grouping of the miners who are rich and can afford the luxury of wasting time on meetings rather than actual mining operations. Those who belong to associations simply do so because they hope to benefit in terms of equipment and funding which has not been forthcoming due to the prevailing harsh economic conditions in the country.

An investigation on whether the small scale miners understand and implement their roles in economic empowerment in their livelihoods

The results show that 95.5% of the respondents' fund their operations, 4.5% of respondents mentioned that they are helped by others and none mentioned government funding. This shows that few of the small scale minors are engaged in economic empowerment strategies being implemented by the country. The reason why miners are toiling to fund their own operations could emanate from the harsh economic challenges and to a larger extent it may be caused by the inconsistency in the country's economic policy. Miners do not exactly know the regulations that govern their operations as there are many ministries who regulate their activities, such Ministries of Finance, Home Affairs, Mines and Mining Development and the Department of Environmental Management Agency, to name a few. As a result, there is bound to be a duplication of regulations by these law enforcement agencies leading to the discouraging of mining in the country.

The other reason could be the withdrawal of donors from the non-governmental organizations due to diplomatic fallout between Zimbabwe and the European Union and the Western countries. Most of the non-governmental and foreign government backed organizations that were assisting the small scale miners, such as the European Union and the ITG/ Practical Action pulled out when the Zimbabwean government had

diplomatic problems with their mother countries. It left a big gap which the small scale miners could no longer afford to fill considering that they had inadequate finances to fund their own operations. To support the above findings, there is none of the respondents that mentioned use of government owned equipment but 27% of the respondents use their own equipment and 66 % use custom milling whereas the remaining 7 % use both own and hired equipment.

This is shown in figure 4.4 below.

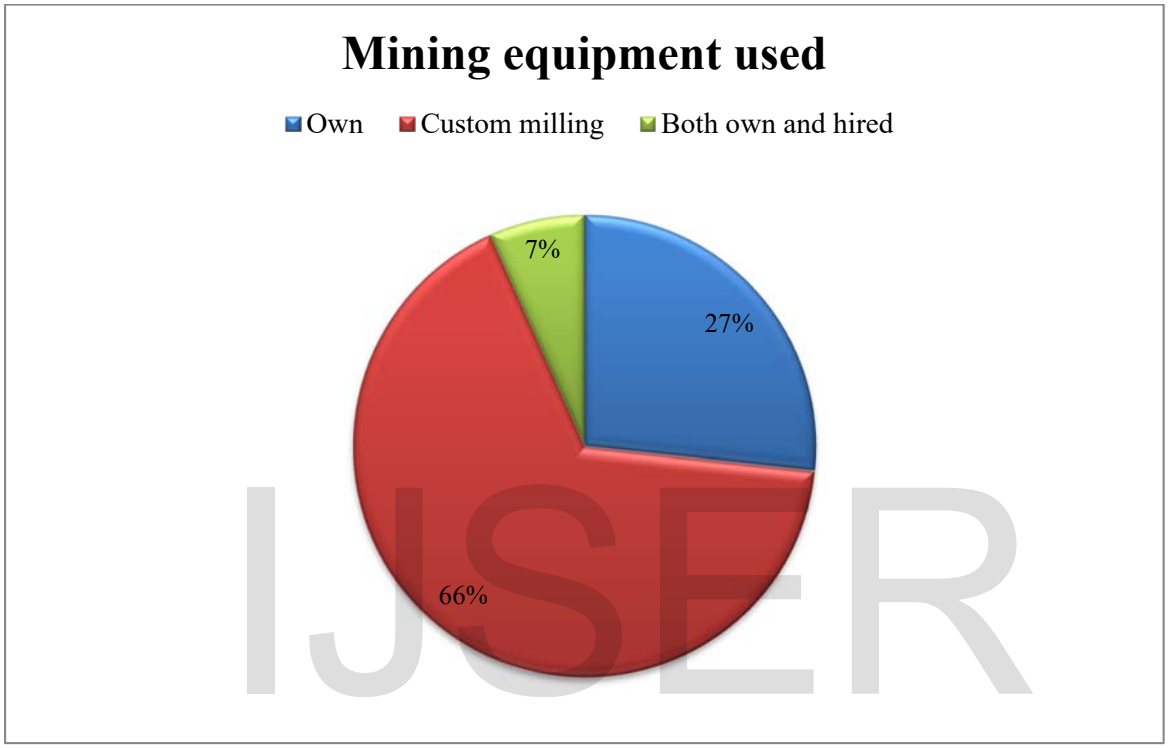


Figure 4.4: Percentages for equipment used by small scale miners

From the results obtained, it is revealed that those with their own equipment have improved gold production. This could be as a result of the non-payment of extra costs of transporting the ore to the mill, milling fees and loss of gold that is washed to the dump site. For those who hire equipment, the challenge could be that they pay costs of hiring and transporting the machinery to their mine sites.

Possibilities of pooling of resources through networking and alliance building to undertake sustainable mining

From the results obtained almost all miners are independent and only a few are members of mining associations therefore these miners can barely access funding from government or banks. It is shown that for most miners, productivity has decreased over the years. Figure 4.4 shows the percentages of miners with increased productivity and those with decrease in productivity over the years.

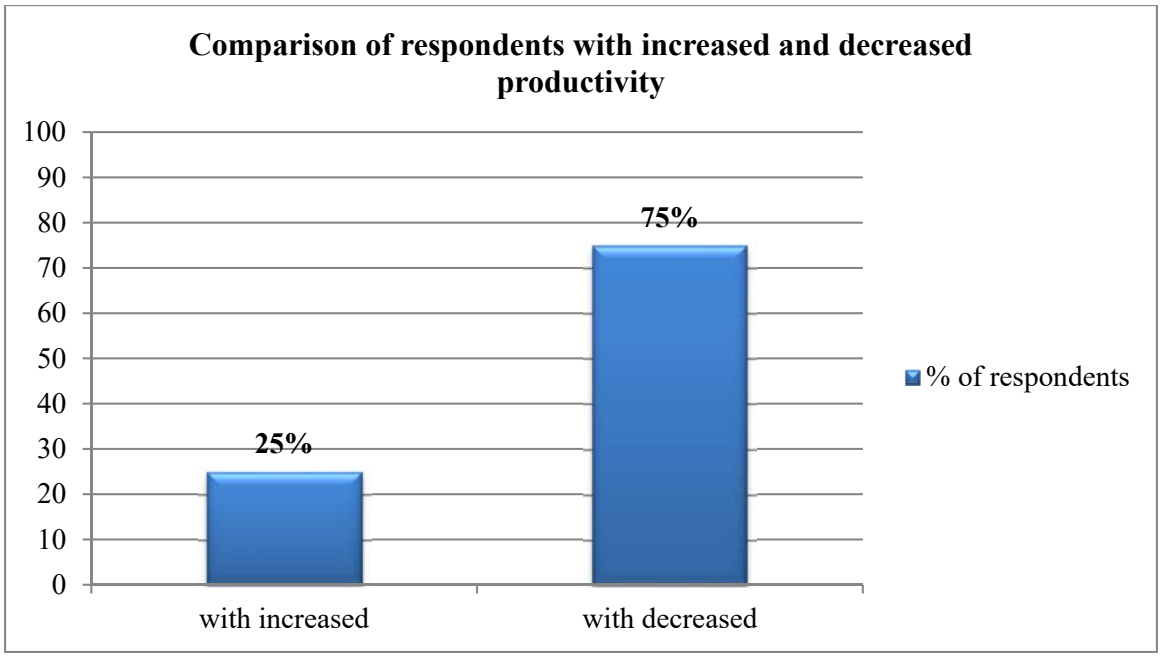


Figure 4.5: Comparison of respondents with increased and decreased productivity

Causes of an increase or decrease in gold productivity

Most of the respondents with increased productivity associated it with skills training and knowledge of proper mining methods. The increase is also associated with proper assaying of the gold reef deposits before mining operations commences to know the actual values of the gold deposits in the ore.

Seventy-five percent of the respondents with decreased productivity associated it with lack of funding, less equipment and lack of proper mining skills. The value of the gold deposits is not properly sampled due to expensive assaying laboratory fees and therefore some miners just mine low grade ore and the production decreases.

According to the respondents' causes of the decrease in gold productivity, 56.5% was inadequate financing of the operations, 30.4% was due to lack of proper mining knowledge and 13% was contributed by the poor grade of the gold reefs.

In a nutshell, the lack of skills training and proper mining methods can cause the decrease in gold production because the resources and time are wasted on areas which have not been properly sampled and wrong mining methods result in less recovery of gold. Lack of financing plays a significant role in decreasing gold productivity in that the equipment used would not match the type of mining method for that particular gold deposit. For example, lack of finance can force a miner to use cheaper open-cast mining method instead of shaft mining that enables better gold recovery.

An assessment of the skills and knowledge of workforce at the small mines to interact effectively with service providers such as mining engineers, geologists and other law enforcement agents

The workforce at the small scale mines are not adequately skilled to interact with the government officials because most of them have never receive basic training on mining or have mining background. The majority of the workforce has on the job training in an informal environment by either the owner of the mine or those with mining background. Most of the respondents felt that the government officials are not there to assist, educate and guide them on proper mining operations but to find faults and punish them through penalties

and fines. The role of these officials should be to impart the skills and knowledge to boost gold productivity and make the miners aware of the environmental concerns and safety measures.

More than forty-five percent of the respondents felt that the government officials are not visible on the mining site when they need assistance because they are always in the comfort of their offices in towns instead of visiting them where ever they are mining. Whenever they visit the government offices, the atmosphere is intimidating so much they end up without getting the necessary assistance because they would not be a position to explain the nature of their problems when they are not at the site.

Fifty-three percent of the respondents expressed that Zimbabwe School of Mines is training miners in a formalised educational environment instead of practical field training that caters for the needs and requirements of the small scale miners. The training modules are not addressing the needs of the small scale miners as they target the medium to large scale mining because they have the finances to send their employees for training. Most of the workforce who did not receive secondary and tertiary education shuns interacting with government officials because they are afraid to show their levels of ignorance so they prefer to hide away from them.

If the workforce is encouraged to attend workshops on mining skills, it would go a long way in boosting their confidence in interacting with law enforcement agencies. Workers have a mindset of fearing the law enforcement agencies as people who are there to punish them and not to educate or assist them in any meaningful way.

An evaluation of the enforcement of the legal instruments and incentives by government to facilitate small scale mining

Most of the respondents were not familiar with the legal framework governing mining. When asked whether the legal framework of Zimbabwe does support small scale mining or not, 36.4 % agreed that it does and the other 63.6% percent disagreed mentioning that it only supports large mining companies. The small scale miners' ignorance of the legal framework that governs their operations could be a result of the fact that government officials do not hold awareness campaigns to educate them on the laws and regulations that govern their operations. The important contribution of the small scale has just been recognized by the whole world and it is having been given the attention it deserves but not much has been done to change the colonial laws that prevented them from enjoying the same privileges as the large scale miners. The 63.6% of miners who felt that the legal framework does not support them expressed that they need a separate Act for the small scale mining sector that empowers them to access equipment and bank loans without putting stringent conditions on them. On the environmental aspect, all the respondents highlighted that in all their operations they consider environmental protection and comply with the national environmental regulations. Their major concern was the cost of compliance when they highlighted that environmental charges also cripple them considering that they are struggling to fund their operations.

Determination of the constituents of the outreach programme modules considering the basic and essential training needs

From the 23.7% of the respondents that attended skills training 12% highlighted that the trainings they attended satisfied their operational training needs whereas the remaining 88% only got basic training and they still need more of technical skills training.

This is shown in figure 4.6.

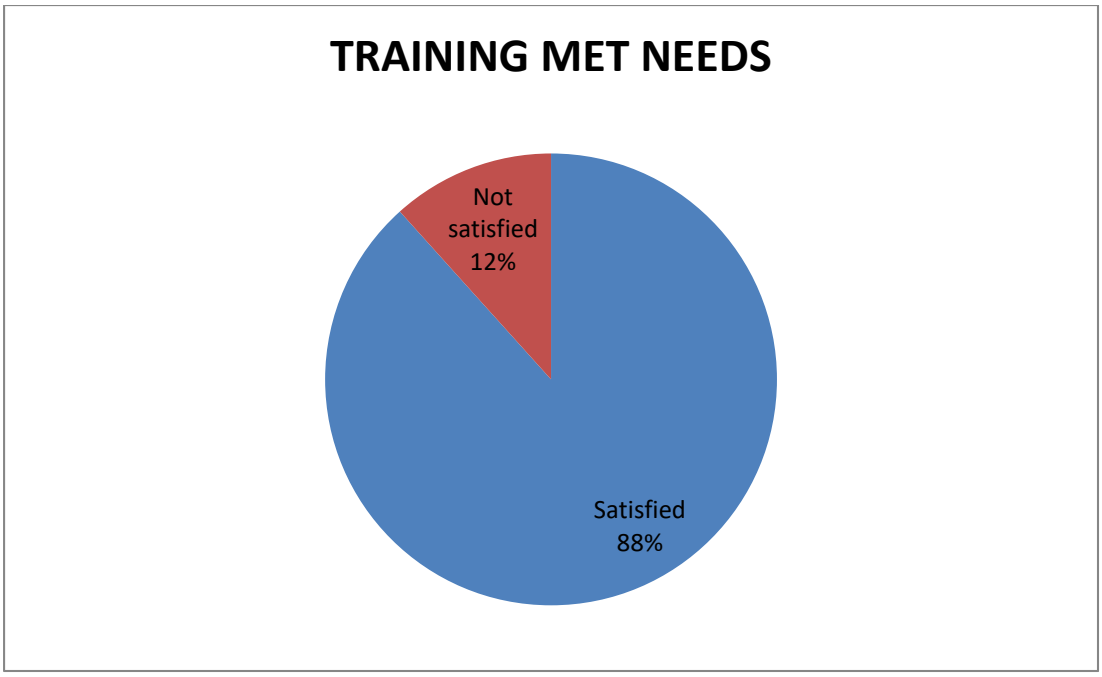


Figure 4.6: Percentages of satisfied and unsatisfied trained miners.

The reason for the dissatisfaction could have been as a result of the changing technology. When they completed the training, there was new equipment on the market such as hammer mills to replace ball mills and stamp mills. The dissatisfied respondents could be those miners who frequent custom milling centres to process their ore and they feel short changed by their service providers if they are lagging behind in technology.

5.0 Conclusions and Recommendations

From the findings, it has revealed that the mining sector is still a male dominated industry with a few females making in- roads in taking up some of the jobs. The energy that is require in the mining sector due to inadequate equipment makes the small mining sector employ young to middle aged people.

Most mine workers are willing to attend skills training and want to improve their livelihoods by getting more revenue from mining. The only challenge they face is that they do not have the information of how to acquire the necessary basic skills to improve their gold production.

The issue of funding remains an uphill task that faces the industry as the miners continue to struggle with outdated equipment. Those who try to fund themselves either ends up decreasing their production levels.

5.1 Conclusions

The respondents were expressing themselves fully in responding to the need for skills training and proper mining methods to improve gold productivity. From the results and analysis, several conclusions were made.

5.1.1 Skills training as a basic requirement

From the responses, it was revealed that the respondents unanimously agreed that skills training and proper methods of mining are the most important factors that influence improved gold productivity even if they differed on the methods of acquiring the skills training and proper methods of mining.

5.1.2 Lack of support by legal framework.

It was revealed that the legal framework does not support the growing small scale mining sector because it has a blanket treatment of both the large scale miners who are financially stable and the small scale miners who are struggling to maintain their operations. Although mining associations lobby for more government support, they are not doing enough to fulfill their mandate of representing the small scale miners and in order to lure more members. As a result, small scale miners are reluctant to be members of associations that are not benefitting them. The majority of miners view these associations as an elitist grouping who do not have the struggling miners at heart.

5.1.3 Lack of government and donor funding.

As reflected in the findings, 95% of the small scale miners fund their operations. The government has little or no assistance in terms of funding that it is giving to small mining sector besides just recognizing its existence. The policy inconsistency was the identified as enemy of development of the mining sector hence the need for government to revisit its policies.

5.2 Recommendations

After presenting the conclusions, it is imperative to make recommendations in order to fill the gaps and shortcomings discovered during the research. The recommendations are made to all stakeholders who participated in the study for future consideration. These are the small scale miners, the government, the donor community, providers of training and to all mining associations in the province.

5.2.1 To small scale miners

It is recommended that the small scale miners should not tire in lobbying for change in the areas that affect them, such as financial support, equipment, a supporting legal framework and accessing skills training facilities. They should join associations so much that they speak with one voice and be heard. If assistance comes, it is channeled through a single body rather than splinter groups.

5.2.2 To government

The government should revisit all the laws that govern the mining operations of the small scale mining sector in order to accommodate the upcoming miners. All government departments should have a participatory approach when implementing projects that affect the small mining sector. Wide consultations and awareness campaign should be enhanced to ensure proper information dissemination and co-operation.

5.2.3 On access to funding

In order to improve communication, the donor community and government should bury their hatchet, have a dialogue and allow donors to reach out to small scale miners and assist with funding their operations by equipping them as was the case before the diplomatic fall-out. Local banks should also come on board in a greater way to support the small scale miners in the same way they are assisting the agricultural sector. Mining is not seasonal like agriculture but can be done throughout the year and with proper funding the production can improve. Banks would be able to recover their finances through terms of payment in a “win” “win” situation. The notion of Mining Bank can be looked into to assist miners.

5.2.4 To the Zimbabwe School of Mines and other training centres

To attract more participants, the training institutions should make a small scale miners’ need analysis to come up with a proper training package tailor-made for the sector at affordable rates. The training modules

should address the skills needed and the continuously offer refresher courses to keep abreast with the changing technology. With the advent of new technology, the modules should be continuously updated.

Accessibility of training centres is of vital importance to both the training providers and small scale miners. Each mining district in Matabeleland South province should have a training centre to impart the mining skills required by the recipients. For example, in Insiza, Pangani Training Centre and Umzingwane's Esikhoveni Training Centre can offer skills training in mining since there are at the heart of the mining areas.

5.2.5 On District Service Centres

There is need for more research on the the idea muted by government and the Reserve Bank of Zimbabwe to establish service centres should come into fruition. These service centres might go a long way in providing equipment for hire to miners, access to technical support and gold buying agents.

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