



Value Addition on Gemstones and its Impacts on Kenyan Economy

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Abstract: *This research entails the study of value addition on gemstones and its impacts on the Kenyan economy. The paper focuses on gemstone mining in Baringo and Taita Taveta counties. The gems and jewellery industry is one of Kenya's promising industries with a potential multi-billion-dollar market across the globe. The main Gemstones mined in Kenya include Tsavorite, aquamarine, emerald, tourmaline, and ruby. The industry can create huge job opportunities, stimulate other economic sectors such as tourism, and also generate foreign exchange. However, due to lack of value addition, the Kenyan gemstone miners have ended up being exploited, hence, receiving no benefits from their business ventures. This research evaluates how mined gemstones can be added value before being sold. Value addition is the enhancement and improvement of a mineral that is done before selling the minerals. By adding value, small-scale gemstone entrepreneurs will benefit from the proven international and local markets as a result of the high prices of their products. The research discusses the application of the four C's criteria of grading; the use of colour, clarity, cut, and carat-weight to grade. The research also discusses various faceting machines that may be used. However, one machine is proposed as the most appropriate one for cutting and polishing gems. The researcher further highlights how the value addition on the gemstones will impact on Kenyan economy and its subsequent contribution in realizing the Big Four; manufacturing, universal health coverage, food security, and affordable housing as well as achieving Vision 2030.*

Keywords - Carat-weight to grade, colour, Gemstones, value addition.

1. INTRODUCTION

Taita Taveta and Baringo Counties are two of the counties in Kenya. They are geographically located within the Mozambique belt. The belt contains high-grade metamorphic rocks which are country rocks hosting precious stones and minerals [19]. Gemstones deposits in the Mozambique belt are highly variegated and can be classified into Magmatic, Metamorphic, Metasomatic and hydrothermal minerals. Previous geological surveys carried out at different times in this region show the presence of mineral deposits in the Country and the surrounding regions. A report written by [2] shows that parts of Taita Taveta County have high and middle-value gemstones including Tsavorite (green garnets), red garnets, ruby, sapphire, tourmalines, rhodolites, and kyanites. On the other hand, Baringo County majorly produces rubies.

This means that the two counties are endowed with many different kinds of industrial minerals and gemstones. Gems are divided into two categories, precious and semi-precious stones. The precious stones include diamonds, sapphire, ruby, and emerald. The semi-precious stones are garnet, amethyst, aquamarine, emerald, pearl, moonstone, alexandrite, sardonyx, peridot, opal, tourmaline, topaz, citrine, turquoise, lapis lazuli, and zircon. In mining, the precious metals, small scale miners use traditional methods of mining which mainly utilizes manual human labour for drilling and hauling the gemstones and waste from underground to the surface which are unsafe, time-consuming, tedious, expensive, and results in a low production rate. After the extraction of the gemstones, they are sold and exported in raw form (rough, unclean, and uncut). Table 1 below outlines the type of gemstone and where they are found across the two counties.

Table 1: Types of gemstones and where they are found.

Type of Gemstone (in reference to colour)	Location
GREENS examples Green Garnet, Green Tourmaline, Green Tsavorite, Green Chrome,	Kishushe, Mkuki, Ngongoni, Mgeno, Dari, Kuranze, Tsavo West, Lwalenyi, Tsavo East, Kamtonga, Mwakitau (Fumba hill), Chawia
RUBY examples Ruby gem, Ruby spinal, Ruby maziwa, Ruby corundum, Ruby nut Ruby caption, 1, 2, 3, Red Ruby.	Taita Taveta County: Kishushe, Ngongoni, Mangare, Kuranze, Tsavo West, Tsavo East, Kamtonga (Misasanyi), Lwalenyi. Baringo County: Bartum, Sandai.
BLUE examples Blue Sapphire, Blue Marble, Blue Sky, Blue kyanite, Blue Tourmaline, Blue lolite,	Kishushe, Kuranze, Kajire Saghala, Mkuki, Kamtonga, Kilili
YELLOW examples Yellow Garnet, Yellow Quartz, Yellow Golden, Yellow Tourmaline.	Kishushe, Ngongoni, Chungaunga, Alia, Lwalenyi
RHODOLITE examples Rhodolite pink sapphire	Kisoli (Kuranze), Mgongoni, Mgeno Ranch, Kishushe, Bungule (Kasighau) Rhodolite spirit
EMERALD	7 Mkuki, Kuranze
BLACK examples Black spinel, Black Tourmaline, Black Garnet	Kilema (Mwachabo)
AMETHYST examples Amethyst purple	Saghala, Irizi, Mwachawaza, Kishushe
CHAWIA examples Chawia blue (Crystal beryl), Chawia green Chawia yellow	Chawia, Kamtonga, Dembwa
COLOURLESS examples Colourless quartz, Colourless crystals	Starehe Kamili (Mwashuma) Alia
TANZANITE	Mwairimba, Snake Hill, Buguta

1.1. Significance of the Research

Both Taita Taveta and Baringo Counties are the leading producers of gemstones in Kenya, but, yet it remains to rely mainly on tourism, pastoralism, and agriculture as their main economic activity. As a result, the revenue obtained from the gemstones trade does not have much impact on the country's GDP. These claims are justified by the low profits the miners are earning from the sale of the raw gems to the brokers who later sell to the black market, denying the government a chance to collect any revenue. However, through the addition of value on the gems, high revenue collection can be achieved, therefore, increasing the sector's contribution to the national GDP. The research discusses various value addition methods and their impacts on the Kenyan economy. As a result, the research contributes to shared knowledge in the gemstones sector.

The research is much in line with VISION 2030 and Big Four Agenda, which aims at transforming Kenya through engaging in active mining, promoting local industries, and the creation of employment opportunities.

2. PREVIOUS STUDIES

Value addition is the enhancement and improvement of a mineral that is done by a company before selling the minerals. The value addition incorporates both reducing the cost of production of a mineral and adding value to the mineral by processing or treating it to raise its selling price [20]. The process of value addition has fundamental advantages to the company, local people and the government at large. Moreover, value addition is the link that can effectively help transform the minerals wealth to economic wealth. Currently, the value addition on minerals and extractives has posed a significant challenge to African countries which are categorized as developing countries [20]. Though the countries are rich in minerals, the poverty levels have continually increased. All this can be explained by the fact that the minerals mined in the developing countries are exported to the foreign countries in raw form. The exports are sold at low prices; thus, government revenues are very minimal, and most of the wealth is gained by foreign countries. The foreign countries add value to the imported raw minerals by processing them and converting them to the final products [7]. The African countries then import these products at high prices. In result, this creates a huge gap between the developing countries and the developed in terms of wealth. The unequal distribution of wealth has contributed to the underdevelopment or slow rate of development in developing nations, particularly Africa.

As described by [16], both industrial minerals and gemstones mined in the country have the potential of generating considerable wealth to various mining prospectors and investors. Previous research has indicated that there could be more than 250 varieties of coloured stones in Kenya. However, the main gemstone being

produced in the country is the Tsavorite [26]. Currently, Kenya is the world's main source of Tsavorite. Despite its enormous contribution to the world in the gem sector, the miners remain exploited and rarely get the value of their hard work. They sell the gems in raw form, which fetches low prices. In one particular case, a 25-carat ruby dubbed pigeon's blood because of its colour was auctioned at Ksh. 2.8 Billion in Geneva, Switzerland [17]. Neither the country nor the miners benefited from the sale of the pigeon's blood gem. Based on this, it is clear that the economic contribution of the gems into the country's economy cannot be ignored. To help the small scale gemstone miners, value addition is necessary to protect the miners from exploitation as well as ensure that the sector's contribution into the Gross Domestic Product (GDP) improves.

Adopted in 2008, the Kenya Vision 2030 development program aims at transforming Kenya into a newly industrialized, middle-income nation. To attain this, three pillars; economic, political, and social, were formulated to ensure a progressive development in the country [21]. In the economic pillar, the value chain approach was promulgated. In this approach, the available opportunities and challenges were analyzed. It was noted that tourism and trade were the foundation for improving the nation's GDP. In the mining sector, value addition was of much concern. As a result, the Voi gemstone center was constructed to help the miners benefit from the ventures. As described [18], value addition to the gemstones will spur not only the economic growth of the miners but also improve other sectors, including tourism. Located along the tropical region, Kenya possess as a nation of great diversity; cultural and nature. Tourists flock into the country every year to enjoy the beautiful beaches, nature, and cultures. As asserted by [18], some of the gem buyers are the tourist who visits the country. In 2018, the mining sector contributed nearly 1% of the country's GDP [25]. Adding value to the gemstone will spur the tourism sector and also improve the sector's contribution to the GDP.

In 2018, the Kenyan government proposed the Big Four Agenda, which solely aims at improving the lives of Kenyans. The four proposed agendas are; enhancing manufacturing, food security, universal healthcare, and affordable housing [14]. Reference [13] alludes that small scale mining operations are poverty-driven. The miners engage in mining as a way to escape poverty rather than as a commercial venture for growth. With no value addition, the miners are exploited by middlemen who buy the raw gems at low prices. With no or less cash to meet their basic needs, the miners cannot afford quality healthcare and food. During their mining ventures, the miners inhale particulates, noxious gases, dust, and also use diverse chemicals which may impact their health. Without health coverage, the miners' health and wellbeing are jeopardized. This will hinder the government's initiative in attaining the Big Four Agenda. Therefore, adding value to the gemstones will not only help the miners gain but also helps steer the nation in attaining the Big Four Agenda.

This research investigates how the small scale miners can benefit from their business ventures through the value addition process. To attain this, the paper suggests a way of adding value to the gemstones through processing by cutting, shaping, and polishing of the gems, which will help in sorting and cleaning the gemstones. The paper further explores the associated economic impacts on gemstone value addition.

3. MATERIALS AND METHODS

3.1. Data Collection Methods

3.1.1. Sampling Technique

The study was both a quantitative and qualitative with the aim of generating accurate data on mining in Taita-Taveta and Baringo counties by interviewing the stakeholders in the mining industry within the counties. This also involved examining past media coverage of the mining activities in the country and the associated political dynamics to highlight on how value addition can be achieved.

3.1.2. Analysis of the data and materials

The collected information from the interviews as well as the documents received from the key stakeholders were analyzed with the aim of presenting an accurate and unbiased assessment of ways the gemstones mined by the sampled population can be added value.

3.1.3. Quantitative research

Quantitative research was done to gather information about existing minerals, their types, the people involved, and value. It was included with data collection through interviews and literature review of existing knowledge.

3.1.4. Qualitative research

Qualitative research included visiting the affected areas, especially those involved in active mining. It also meant making observations, interacting and discussing with the local miners and conducting interviews with individuals and groups. The interviews target was the artisanal and small-scale miners, ideally, those involved in the gemstone mining industry, including investors, producers or miners, national and county government officials.

4. RESULTS AND DISCUSSION

The following section covers the analysis of the data collected. Furthermore, the researchers have discussed in details the objectives of this research. The outcomes of each objective are also included in this section.

4.1. Results

The collected data was analyzed and presented in a table, as seen below in table 4.

Table 2: Summary of the collected data.

	Baringo County		Taita Taveta County	
	Small-Scale miners	Kenyan Middlemen (Traders)	Small-Scale Miners	Kenyan Middlemen (Traders)
Value addition Used	Sorting only	Sorting and Polishing only	Sorting only	Sorting and Polishing only.
Selling Price	Low	Medium	Low	Medium
Profit	Low	Medium	Low	Medium
Licensed	Non-licensed	Few licensed	Few licensed	Few licensed
Government Support (Grants, healthcare coverage)	None	None	None	None

4.1.1. Value addition on gemstones

After the gems are mined, the value addition journey starts immediately. The gemstones are taken under various stages of processes with each level trying to improve the value to increase the price of the gem. The adding value starts with sorting and grading of the gemstones. Currently, little is done in the sorting of gem across the two counties. The miners majorly engage in sorting which entails the manual separation of valuable gems from the valueless stones. The valueless stones are the highly fractured ones and those with high inclusions of the host rock. The valueless stones are disposed of while the valuable gems are sold to the middlemen by the miners.

To improve the miners’ value addition process, this research proposes the use of four C’s criteria for grading. The criteria involve grouping the gems in terms of colour, clarity, cut and carat – weight (4cs.gia.edu, 2019). The criteria affect the price of the gemstones. A gemstone with a better colour grade, clarity, cut and weigh much will be priced higher. Though this criterion is commonly used in the diamond industry, it can be successfully utilized in the grading of the gemstones.

4.1.2. Four C’s Criteria

4.1.2.1. Colour

Gem colour is described by the use of three properties: hue, tone, and saturation. A colour grade cannot be determined by just one of the three but a combination of the three. Miners who have no skills in grading only use the hue as an overall colour grade. This mostly results in under grading of the gems. Hue is the first impression of basic gem colour, as seen in Figure 1 below. It might be described as red, orange, yellow, green, blue, violet, or purple. A gem’s tone refers to a gem’s relative lightness or darkness. Black and white are tones, from darkest to lightest. Saturation refers to the intensity of its hue. Colours can be strong or soft pastels. Pink is desaturated red. Warm colours, like red and orange, become shades of brown as their saturation decreases.

4.1.2.1.1. Hue

A hue wheel is suitable to use for help in determining the correct hue of a gem.

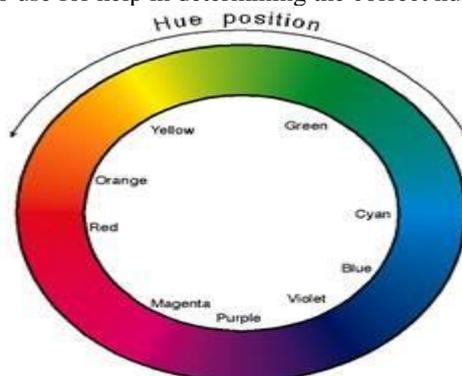


Figure 1: hue wheel. Source: [1]

Stones that show a combination of hues face-up is usually less valuable than stones that show a single pure hue.

4.1.2.1.2. Tone

The degree of lightness or darkness of a colour, as a function of the amount of light, absorbed. The colour tone varies from "very light" to "very dark". It is the amount of black or white mixed into a colour. In the extremes, a coloured stone could be white (light 5) or black (dark 95) with just a hint of colour.

4.1.2.1.3. Saturation

It refers to the strength and purity of the hue. High saturated gems appear more intense in colour, or they reflect the pure colour, as seen in Figure 2 below.



Figure 2: Different saturations in Tsavorite. Source: [4]

Another crucial property to consider while grading a gem in terms of colour is the colour zoning. Various gems show colours only in some layers or parts. This has a great impact on the value of the particular stone. The property of colour zoning can be utilized in grading by use of four levels of zoning.

- None: The colour is equally distributed
- Faint: One might see changes in colour saturation
- Gradual: The colour weakens in some parts but not abruptly.
- Visible: Stone has clear colour patches or layers.

4.1.2.2. Clarity

This is the second C of the four C's criteria. In gems, clarity usually checks on the occurrence of inclusions in a gem which result from geology. Inclusions can be defined as anything that usually interferes with the free passage of light in a faceted gem. However, some of the inclusions have a positive effect on the appearance of a gem. For instance, fine inclusions can scatter light within a faceted stone, therefore, making extinction less noticeable.

Generally, gems fall under three main categories: those that are free from inclusions, those which usually have inclusions, and those which almost always have inclusions. Examples of the gems that almost always have inclusions are Emeralds, rubies, and sapphires.

4.1.2.3. Carat Weight

A carat is a unit for measuring gem weight. One carat equals 1/5 of a gram or 200 milligrams. Most gemstones are only available in smaller sizes; therefore, the larger stones have high demand, thus a higher price per carat. For example, a quarter-carat topaz may cost \$60 per carat, or \$15 total. A half-carat topaz, with the same colour, clarity and cutting grades, might cost \$100 per carat, or \$50 total. For a topaz one-carat and over in size, the price could reach \$200 per carat. So a one-carat stone will cost over \$200 total. From this, it is apparent that the heavier the gem, the higher it costs. Nevertheless, the value of a large gem may drastically reduce if the stone reaches a size that is impractical to use in jewellery. Importantly, the carat weight differs with each type of gemstone. Two gems may have the same dimensions but weigh differently. This is because of their differences in the specific gravity.

4.1.2.4. Cut

It refers to the shape of the gemstone. It includes the proportions of the various parts of the gem, the finishing touches, and the polish. The cut is one of the most important factors in gem grading and also has a tremendous effect on a gem's appearance.

A gemstone may be cut into various shapes such as rounds, ovals, cushions, pears, octagonal cuts, hearts, marquise, hexagons, triangles, and carved gems among others as seen in Figure 3.

A gem is cut/faceted into three basic parts: the crown, girdle, and pavilion.



Figure 3 parts of a cut gem. Source: <https://www.gemsociety.org/article/gem-cutting-terms/>

The evaluation of cut incorporates the following:

4.1.2.4.1. Shape

The shape describes the girdle outline of a gem such as round, oval, or cushion. Various shapes which are rarer such as rounds receive a value that is 10-20% above the oval price [4]. On the other hand, Pears and marquises are less desirable, therefore are priced about 10–20% less than ovals of the same quality. However, the prevalence of shapes such as oval is because of their ability to retain the weight of the gem.

4.1.2.4.2. Cutting style

Various cutting style fetches high premiums. Each type of gem has its standard market style. For instance, the mixed cut is the market standard for ruby and sapphire, whereas the step is the standard for emerald.

4.1.2.4.3. Proportions

This is determined by the two main parts of the gem: crown and pavilion. The crown primary purpose is to catch the light and create dispersion [4]. The pavilion job is both for brilliance and scintillation. Generally, when the crown height is too low, the gem lacks sparkle. Shallow pavilions create windows, while overly deep pavilions create extinction. In order to retain the weight of the gemstones, they should be cut with overly deep pavilions.

4.1.2.4.4. Symmetry

A well-cut gem has a high value than other gems.

4.1.2.4.5. Finish

The better the finish, the higher the price. The following defects reduce the value of the gemstones; facets do not meet at a point, misshapen facets, rounded facet junctions, and poor polish (obvious polishing marks or scratches).

4.1.3. Gemstones cutting and polishing

There are four basic styles of gem cutting: tumbling, capping, faceting, and carving. This research discusses faceting as the style of gem cutting. Faceting entails the process of cutting fine rough into a glowing finished gemstone. The process of cutting begins with a rough crystal. The gems come in various forms and shapes. For instance, some may be in their natural form, others are broken during the mining process, or they may appear in the alluvial form.

Cutting, shaping and polishing of a gem gives it the beauty thus highly contributes to the price. High expertise is required in cutting as one should try to maximize the final gem size obtained from a rough gem with minimum weight loss. There is a challenge of balancing the weight and having good proportions for creating a good light return. Steps in gem faceting are:

4.1.3.1. Planning the cut

This is the first step in the cutting. The cutter carefully checks the properties of the rough crystal such as the colour zoning, inclusions, and its shape. These are factors which determine the shape of the gem to be faceted. Some of the inclusions are also removed in this stage. Once the stone has been examined, the cleaning of the stone begins.

4.1.3.2. Pre-shaping

After the stone is cleaned, pre-shaping is done. The following processes are involved in the pre-shaping

- Sawing- It is the process of removing unwanted material to a moderate value.
- Grinding- it is used to shape the gemstone to the desired rough form.
- Sanding- its purpose is to remove deeper scratches left during grinding.
- Lapping- it is used especially to create flat surfaces on a stone.

4.1.3.3. Faceting

The cutting process intensifies at this stage. The grinding lap is removed from the machine, and a faceting lap is now used, which is a much finer lap primed with very fine diamond powder. The facets are placed on the stone at extremely precise angles. Using the handheld faceter, the cutter uses the Height which controls the depth of the cut, Angle which controls the plane of the facets, and Index triangle which controls the placement of facets around the gem. The facets are placed separately on the crown and pavilion.

Notably, there are no fixed angles set to be used in every gemstone. Each gem has different requirements due to the varying critical angles. A critical angle is the minimum possible angle for a facet to reflect light back into the gem. The angles vary due to the difference in the refractive index (RI) of gemstones. The critical angle should be known for each gem to prevent any occurrence of unplanned light leakage. This occurs when the light hits the facet outside the critical angle.

4.1.3.4. Polishing

This is the final stage. A finer special polishing lap is used. Each facet is polished individually, which results in a mirror-like finish to aid light reflection from the surface of the stone.

4.1.4. Gem cutting machines.

Various machines are used in the process of cutting and polishing the gems. This research analyses three of the commonly used machines to find the most suitable for the use in Kenya; Facetron, Ultra Tec, and OMNI.

4.1.4.1. Facetron

Its price estimated to be \$3195.00. It is considerably cheaper than Ultra Tec.

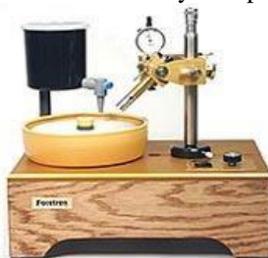


Figure 4: A Facetron Machine. Source: <https://www.gemsociety.org/article/facetron-facetingmachine>

Facetron has the following characteristics:

- It is an excellent mid-priced faceting machine with excellent build quality.
- It is easy and smooth in operation
- Facetron has superior quality and precision, which leads to the creation of a beautiful gemstone.
- It does not have any markings on the mast because of the clamp/slide style system that is used to raise and lower the faceting head on the mast
- The fit and finish obtained from the Facetron are of good quality. The finishes obtained are clean and anodized for protection from the cutting water and stone dust that occur during the cutting process.
- The controls are marked adequately. However, it has no markings on the mast.

4.1.4.2. Ultra-Tec

It has an estimated cost of \$3380.00. With this price, it is one of the most expensive machines of gem cutting behind Facette (\$4495.00). The fit and finish of an Ultra Tec faceting machine is very high quality [10].



Figure 5: An Ultra-tec Machine. Source: <https://www.gemsociety.org/article/ultra-tec-faceting-machine/>

The following are some of the characteristics of Ultra Tec.

- The finishes obtained are clean and anodized for protection from the cutting water and stone dust that occur during the cutting process.
- The machine controls are clearly marked. The actual etching, numbers on the mast and dial, are high quality. The markings provided are fundamental during the cutting process.
- Ultra-Tec is accurate and easy to use
- It has a wide range of substantial index gears which are easy to change.
- They do not vibrate and make noise as they are direct drive and has no belt. Instead of a belt, they utilize a rubber cone.
- It has a rubber splash guard which functions to catch the water run-off during the cutting process.

4.1.4.3. OMNI faceting machine

It is estimated to cost \$ 2390.00. It is probably the smallest faceting machine available.



Figure 6: OMNI Faceting Machine. Source: <https://www.gemsociety.org/article/omni-faceting-machine/>

The following are the characteristics of the OMNI faceting machine.

- The machine is compact, therefore requires limited workspace and its portable.
- It is much like a Facetron machine in fit and finish and also in adjustments. However, its fit and finish are less in quality compared to the Ultra-Tec finish.
- The finishes obtained are clean and anodized for protection from the cutting water and stone dust that occur during the cutting process.
- Controls are not well marked

From the above-described faceting machines, this research proposes the use of the Ultra Tec faceting machine for set up at gem cutting facility or lapidary shop. Though it the most expensive amongst the four its finishing, quality and accuracy are worth the price.

4.1.5. Gemstone prices

As mentioned earlier, the prices vary in reference to the level value addition. An ungraded rough gem will cost less than a graded one which in turn will cost less than a well-cut and finished gem.

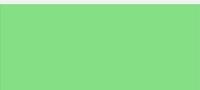
The following table shows the prices of Tsavorite that has undergone the four C grading criteria.

Valuation date: 30 January 2019

Values in USD per carat; ref. clarity = VVS, ref. cut = Excellent

Table 4: Value table for Tsavorite Garnet (source: Gemval.com, 2019)

Value Addition on Gemstones and its Impacts on Kenyan Economy

Colour	Colour Description; Occurrence	1 ct.	3 ct.	5 ct.
	088 - medium dark Green; strong Alternative name, occurrence category: Rare	717.84	1,555.96	2,394.09
	086 - medium Green; very slightly greyish Alternative name, occurrence category: Rare	656.03	1,421.98	2,187.94
	078 - medium dark slightly yellowish Green; strong Alternative name, occurrence category: Rare	577.59	1,251.98	1,926.36
	083 - medium light Green; very slightly greyish Alternative name, occurrence category: Rare	282.04	611.35	940.66
	065 - medium light yellowish Green; very slightly greyish Alternative name, occurrence category: Common	140.76	305.11	469.46

The prices in the table are substantially higher than those of ungraded Tsavorite, which lies between 50\$- 300\$ per carat.

4.1.6. Economic Impacts of Value addition on Gemstones

4.1.6.1. Earn Foreign Exchange

Reference [24] describes that exportation of gemstones has been earning Kenya foreign exchange. However, the amount attained is low since most of the exported gems are in raw form. From the price valuation, adding value to the gems increases its selling price by over 100%. Also, [12] alludes that the tourism sector will be enhanced due to the value addition on the gemstones. The visiting tourist brings forth foreign exchange into the nation. As a result, adding value to gemstones will aid in earning foreign exchange.

4.1.6.2. Contribution to the GDP

As described by [25], the mining sector contributes nearly 1% to the national GDP. Based on the nation's natural resource capability, this contribution is low. Adding value to the gemstones will create employment for youths in the lapidary shops and also earn taxes. Through its center in Voi, the added value gems will be registered by the government [22]. Upon selling the precious resources either in international or local markets, the owners pay royalties and taxes to the government. Hence, the value addition will contribute to the nation's net GDP.

4.1.6.3. Realization of Vision 2030 and Sustainable Development Goals (SDGs)

The Vision 2030 strategy and approaches focus on reforms and development across tourism, agriculture, manufacturing, trade, and financial services, amongst others. Attaining these reforms has been a significant focus for the nation. In transforming the country's economic sector through enhanced tourism and trade, value addition on gemstones is imperative. As asserted by [21], the Vision 2030 aims at transforming Kenya into a newly industrialized middle-income country offering high-quality life to its citizens. The three main pillars; political, social, and economic can be attained through encouraging value addition or enhancing value chain across all the nation's economic sectors. In the Sustainable Development Goals (SDGs), poverty eradication, ensuring better healthcare, and ensuring environmental sustainability can be attained in Kenya through the value addition on gemstones [3]. The local miners will be able to obtain the value of their exploits, meet their basic needs, and also take health covers.

4.1.6.4. Achieving the Big Four Agenda

With the view of helping the nation combat immediate problems, the government formulated the Big Four Agenda, which entails enhancing manufacturing, ensuring food security, providing universal healthcare, and offering affordable housing. For the small scale gemstone miners, universal healthcare and food security have been a major challenge. For instance, though the precious metals are found in Baringo County, there have

been several reported incidences where people die due to hunger. Also, miners cannot access quality healthcare. To improve the standards of living of the miners, introducing value addition as mandatory will aid in achieving the Big Four. With the high prices, the miners can pay for medical covers, buy food or even start irrigation projects. Thus, the Big Four governmental initiatives can be attained through value addition on gemstones.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Recommendations

From the research, the following recommendations are proposed to the government of Kenya; both national and county governments.

- Setting up a gemstone center at Voi to purchase the gemstones from miners directly in order to avoid middlemen. A gemstone exchange bank can also be considered.
- It should be mandatory or legal for all the gemstones miners to add value to the mined gemstones before exporting them. Restricting the exportation and selling of raw gemstones.
- Invite foreign investors and encourage them to start gemstone cutting in the country and also empower locals on gemstone cutting techniques.

5.2. Conclusion

This research found that gemstone miners in Kenya face diverse challenges; market and price exploitation. Establishing value addition on the gemstone is imperative in attaining Vision 2030 and the Big Four Agenda. The research findings concur with the reviewed literature that gemstone miners are the backbone of rural areas development. Due to its effectiveness in combating poverty in the rural areas, gemstone mining economic contributions should not be overlooked. Setting up a value addition facility that will strictly deal with the processing of the gemstones before they are sold and empowering people on cutting and polishing techniques, will facilitate on how gemstones can be sold locally or exported in ways that will earn the government and the people revenue at an optimal profit.

The research proposes the purchase of Ultra Tec faceting machine for set up in gem cutting facility. The machine will aid in transforming the value addition process. Indeed, value addition on gemstones should be made mandatory through the promulgation of the necessary legal frameworks which prohibits the trading of raw gems. Through the value addition, the country will be able to earn foreign exchange, improve the sector's contribution to the net GDP, help in Vision 2030, and aid in attaining of the Big Four Agendas.

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